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Vocational Education in Life Science, Recreation and Agriculture: Course Options and Suggested Courses of Study for New Hampshire High Schools.

New Hampshire Agricultural Teachers' Association.; New Hampshire State Dept. of Education, Concord. Vocational-Technical Education Div.; New Hampshire Univ., Durham. Agricultural Education Program.

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Developed by teacher educators in cooperation with state supervisors of agricultural education, this curriculum guide is for use by teachers, teacher educators, guidance departments, and school administrators. The 4-year curriculum was designed for vocational agriculture students in grades nine through 12 interested in occupations in production agriculture, ornamental horticulture, forestry, agricultural resources, agricultural mechanics, agricultural supplies, agricultural products, and other agriculture. The procedure suggested by the authors for curriculum implementation includes: (1) appointing an advisory committee, (2) studying the school area to determine needs, (3) developing long-range goals, and (4) determining the specializations to be offered. Course content for each occupational area is outlined with the level of specialization included. Introductory material is provided for ninth and 10th grade students and specialized material for 11th and 12th grade students. Supplementary material includes a 118 item bibliography. (DM)

c1

Agricultural
CURRICULUM GUIDE

PRODUCTION AGRICULTURE
ORNAMENTAL HORTICULTURE
FORESTRY
AGRICULTURAL RESOURCES
AGRICULTURAL MECHANICS
AGRICULTURAL SUPPLIES
AGRICULTURAL PRODUCTS
OTHER AGRICULTURE

ED025590

NEW HAMPSHIRE
1 9 6 8

VT003831

"Agriculture Is More Than Farming"

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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VOCATIONAL EDUCATION IN LIFE SCIENCE, RECREATION AND AGRICULTURE

COURSE OPTIONS

and

SUGGESTED COURSES OF STUDY

for

NEW HAMPSHIRE HIGH SCHOOLS

Prepared Cooperatively by:

3 New Hampshire Agricultural Teachers' Association,

Agricultural Education Program,
4 Univ~~ersity~~ of New Hampshire
Durham, New Hampshire

Vocational-Technical Education Div~~ision~~
5 New Hampshire State Dep~~artment~~ of Education
Concord, New Hampshire

1967

VT 003 831

MEMORANDUM

TO: The ERIC Clearinghouse on Vocational and Technical Education
The Ohio State University
980 Kinnear Road
Columbus, Ohio 43212

FROM: (Person) Martin L. Mitchell (Agency) Consultant, Ag. Education
State Department of Education
(Address) Vo-Tech Division, Stickney Avenue, Concord, N. H. 03301

DATE: December 3, 1968

RE: (Author, Title, Publisher, Date) Vocational Education in Life Science, Recreation and Agriculture Course Options and Suggested Courses of Study for New Hampshire High Schools.

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Type of Program Vocational Agriculture
Occupational Focus On the 8 areas included in Vocational Agriculture
Geographic Adaptability
Uses of Material Curriculum Guide
Users of Material Teachers, teacher educators, guidance departments, school administrators

(4) Requirements for Using Material:
Teacher Competency No special qualifications beyond normal certification as Vo-Ag instructor
Student Selection Criteria No special qualifications.
Time Allotment 4-year curriculum

Supplemental Media --
Necessary ☐
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(address)

Foreword

This publication was prepared specifically for use as a guide for present and prospective vocational teachers in Life Science, Recreation and Agriculture. The content has been arranged to provide assistance in developing a total instructional program which will meet the needs of secondary schools of New Hampshire.

Administraters and Advisory Council members will find this publication useful as a guide for the planning of new programs and the further development of on-going programs.

This content was developed by teachers of agriculture and students enrolled in curriculum development classes at both the undergraduate and graduate level in Agricultural Education at the University of New Hampshire. The assistance of all subject matter departments and extension specialists of the College of Agriculture are acknowledged.

Mr. Emery P. Booska and Mr. David Larrabee have been responsible for arranging the details of this publication.

W. H. Annis
Associate Professor
Agricultural Education

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William H. Annis
Emery P. Booska
David P. Larrabee

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INTRODUCTION

Federal aid to Vocational Education in Agriculture became a reality with the passage of the Smith-Hughes Act of 1917. Teachers of Vocational Agriculture in New Hampshire have traditionally been charged with the responsibility for developing the curricula for various schools in which they taught. The State staff as well as local faculty felt the needs of the community could best be related to instruction by the person teaching the course. With the advent of regionalization and thus larger school service areas, it became more and more difficult for teachers to really know the needs of this enlarged community. Confounding the problem was the desire to use this knowledge of local needs in the curriculum. In 1962 a group of teachers met and outlined a two-year basic curriculum of Vocational Agriculture in New Hampshire.

The Vocational Education Act of 1963, which allowed the program to include non-farm agricultural occupations, set the stage for the 1964 Vocational Agriculture Curriculum Workshop. This workshop promoted the concept of specialization areas within the Vocational Agriculture Program.

The four-year curriculum in Vocational Agriculture now includes:

Grade 9 & 10	Introduction to Basic Life Sciences, Agriculture and Recreation
Grade 11 & 12	Specialization (1) Agricultural Production (2) Agricultural Supplies (3) Agricultural Mechanics (4) Agricultural Products (5) Ornamental Horticulture (6) Agricultural Resources (7) Forestry and Recreation (8) Other Agriculture

The local administration, teachers and advisory committees will decide upon these specializations. It is anticipated that some schools will offer a program in the non-farm specialties such as products, supplies and resources with little or no reference to production agriculture.

It should also be noted that as specializations are developed pupils in grades 11 and 12 may transfer from one school to another taking advantage of the New Hampshire Area Vocational School program to obtain a program which will meet their occupational objective.

In schools where specializations have been developed it has become evident that one teacher can carry a maximum of two closely related areas of specialization. Ideally, in multiple-teacher departments, one man should teach only one specialization for optimum educational benefits. To avoid very narrow programs in one-teacher departments, it is recognized that one must accept less than optimum educational benefit to provide for diversity within the program.

To assist local officials in developing organizational patterns the following examples of scheduling a one-man program are offered:

Example I

One Teacher

Grade 9	Grade 10	Grade 11 & 12	Grade 11 & 12
Introduction	Introduction	Specialization	Occupational Mix*
1 period	1 period	double period	1 period

Example II

One Teacher

Grade 9	Grade 10	Grade 11 & 12 Combined**	
Introduction	Introduction	Specialization I	Specialization II
1 period	1 period	2 periods	2 periods

*Occupational Mix - A group of students from all areas of Vocational Education who can profit from the instruction of this specialization.

**Individuals may elect specialization I or II but not both.

Example III

One Teacher

Grade 9	Grade 10	Grade 11 & 12 Combined		
Introduction 1 period	Introduction 1 period	Specialization I*** 1 period	Specialization I & II Work Common to Both 1 period	Specialization II 1 period

*** Pupils enrolled in Specialization I would take periods I and II.
Pupils enrolled in Specialization II would take periods II and III.

It is anticipated that most schools will employ at least two teachers and offer a minimum of three areas of specialization in grades 11 and 12.

Multiple-teacher departments have the advantage of sharing the work load and thus able to offer programs with a wider choice for specialization; for example, in addition to the introductory 9th and 10th grade courses a multiple-teacher department might offer an opportunity for specialization in production agriculture, ornamental horticulture, greenhouse management, and Forestry and/or Recreation. It has also become evident that pupil scheduling becomes easier and courses which meet the specific pupil needs can be more readily added.

The actual possibilities for course offerings within multiple-teacher departments will vary with the characteristics and needs of each school district. Initiative and flexibility must be shown in developing new courses designed to reach those for whom a minimum education is the only hope for dignity and economic freedom. Four types of programs are normally considered for these people.

1. A slowed down version of the regular program (normally taking two years to cover one normal year's work).
2. Special programs designed to teach saleable skills with little or no background theory.
3. Special programs designed for teaching single concept skills.
4. A family centered program (normally out of school youth who

have dropped out of school and have few if any saleable skills).

Multiple-teacher departments have more chance of success if the following guidelines are adhered to:

1. A department chairman is appointed.
2. The teaching duties are divided in a manner to best utilize each teacher's talents and professional preparation.
3. Responsibility for FFA, publicity, judging teams, civic participation, school participation, advisory council meetings, and similar things are officially decided upon within each department.
4. The curriculum offered is specialized sufficiently to gain saleable skills, but flexible enough to attract and meet the needs of students who will be going on to additional post-secondary education prior to entering their chosen agricultural occupations.
5. Provisions are made for developing or cooperating in the development of a program for students with special needs.

PROCEDURE FOR USING THIS CURRICULUM GUIDE

Curriculum development denotes change--change in program objectives and methods. As school districts implement the specializations within this curriculum guide the general program of vocational agriculture must be reduced to provide teacher and pupil time for specialization. For present on-going programs this guide will enhance the instruction. For new schools it will provide a basis for sound program development. To assist teachers in both on-going programs and new programs the following procedure is suggested for curriculum implementing:

1. Local Board of Education to appoint an Advisory Committee using procedure suggested in Guidelines for Developing Vocational Education Programs (revised mimeograph 1967 - available from Vocational-Technical Division, State Department of Education, Concord, New Hampshire.
2. The Advisory Committee and teacher study the school area to determine the needs for specific specializations.
3. Determine long range goals for the program.
4. Determine what specializations should be offered based upon
   a. the needs of the school community
   b. the facilities available or prospect thereof
   c. the abilities of the teacher
   d. the interests of the community and pupils

To accomplish the above procedures the following steps in curriculum development are suggested:

Step I Determine what Should be Offered in an Agricultural Curriculum for ____________________ High School.

Criteria for Determining What to Teach.

1. Should provide comprehensive training in the specializations to be taught.
2. Should provide for the learning of basic principles in the introductory years and years of the specializations.
3. Should be supported by planned experience programs which apply the subject matter of the specializations taught.
4. Should provide for timely instruction anticipating seasonal decisions basic to the operation and completion of the planned experience programs.
5. Should provide increasingly complex and challenging study based on the ability and maturity of the pupils enrolled.
6. Should provide for the study of basic fundamentals of human relations and sound decision making.

Step II Determine the Distribution of the Subject Matter that Should be Taught.

Criteria for Determining Which Year to Teach Certain Subject Matter.

1. Should provide a greater emphasis on the background and basic fundamentals during the first two years.
2. Should provide more advanced and complex study in the specialization years.
3. Should provide for subject matter to be coordinated with the planned experience program needs of the pupils.
4. Should provide for those mechanical skills which relate to the area of specialization.

Step III Determine the Distribution of Teaching Units During the Year for Each Class.

Criteria for Determining When to Teach Certain Subject Matter During a Given Year.

1. Should be based on timeliness to allow for carry over to the planned experience programs.
2. Should allow for effective use of all facilities by distributing the use throughout the year.
3. Should allow for a schedule of activities such as parliamentary procedure, public speaking and other leadership activities.
4. Should indicate the month and approximate number of periods to be spent on each job taught.

It is not recommended that everything suggested for the introductory years be taught in a given school. The teacher must decide if he is to sample all areas of agriculture or if he is going to build background for his specialization areas. The teacher then marks directly in this Guide under the grade the month and approximate number of periods to spend on a particular job. This procedure allows the program to develop based on the needs of the local school community.

AGRICULTURE	01.00-00-00-00
AGRICULTURAL PRODUCTION	01.01-00-00-00
Animal Science	01.01-01-00-00
Dairy Cattle, Livestock, and Poultry	01.01-01-01-00
	01.01-01-01-01

	Level * I/S	Grade 9 10 11 12
Dairy Cattle		
I. Economic Importance of Dairy Farming in New Hampshire, Northeast and United States	I	
II. Occupational Opportunities	I	
A. Production		
B. Instruction		
C. Research		
D. Extension		
E. See *Encyclopedia of Careers for Vocational Guidance*		
III. Description	I	
IV. Origin	I	
A. Ayrshire		
B. Brown Swiss		
C. Guernsey		
D. Jersey		
E. Holstein		
F. Others		
V. Selection	I	
A. Breeder Replacement and Show		
1. Show animals		
2. Blood lines		
3. Production testing		
4. Type and individuality		
B. Production for Income		
1. Commercial		
2. When to buy and sell		

* I = Introduction / S = Specialization

01.01-01-01-02
01.01-01-01-03

	Level * I/S	Grade 9	10	11	12
Beef Cattle					
I. Economic Importance in New Hampshire, Northeast and United States	I				
II. Occupational Opportunities	I				
A. Production					
B. Instruction					
C. Research					
D. Extension					
E. See Encyclopedia of Careers for Vocational Guidance					
III. Description	I				
IV. Origin	I				
A. Angus					
B. Hereford					
C. Other					
V. Selection	I				
A. Breeder Replacement and Show					
B. Production for Income					
C. Multi-purpose or Dual Purpose					
D. Pure, Cross					
Swine					
I. Economic Importance in New Hampshire, Northeast and United States	I				
II. Occupational Opportunities	I				
A. Production					
B. Instruction					
C. Research					
D. Extension					
E. See Encyclopedia of Careers for Vocational Guidance					
III. Description	I				
IV. Origin	I				

01.01-01-01-03
01.01-01-01-04
01.01-01-01-05

	Level * I/S	Grade 9	10	11	12
A. Berkshire					
B. Chester White					
C. Duroc					
D. Hampshire					
E. Spotted White					
F. Tamworth					
G. Yorkshire					
V. Selection	I				
A. Breeder Replacement					
B. Production					
Sheep					
I. Economic Importance in New Hampshire, Northeast and United States	I				
II. Occupational Opportunities	I				
A. Production					
B. Instruction					
C. Research					
D. Extension					
E. See Encyclopedia of Careers for Vocational Guidance					
III. Description	I				
IV. Origin	I				
A. Cheviot					
B. Dorset					
C. Hampshire					
D. Oxford					
E. Shropshire					
F. Others					
V. Selection	I				
A. Breeder Replacement					
B. Production					
Poultry					
I. Economic Importance in New Hampshire, Northeast and United States	I				

01.01-01-01-05
01.01-01-01-06

	Level	Grade			
	* I/S	9	10	11	12
II. Occupational Opportunities	I				
A. Production					
B. Instruction					
C. Research					
D. Extension					
E. See *Encyclopedia of Careers for Vocational Guidance*					
III. Description	I				
A. Chicken					
B. Ducks					
C. Turkeys					
D. Game Birds					
IV. Origin	I				
A. Chickens					
1. American					
2. Asiatic					
3. Mediterranean					
4. English					
5. Other					
B. Ducks					
C. Turkeys					
D. Game Birds					
E. Others					
V. Selection	I				
A. Breeder Replacement					
B. Meat					
C. Production (eggs)					
D. Recreation (game birds)					
E. Show					
Horses					
I. Economic Importance in New Hampshire, Northeast and United States	I				
II. Occupational Opportunities	I				
A. Riding Horse Farmer					
B. Horse Trainer					
C. Farrier					
D. See *Encyclopedia of Careers for Vocational Guidance*					

01.01-01-01-06
01.01-01-01-99

		Level	Grade			
		* I/S	9	10	11	12
III.	Description	I				
IV.	Origin	I				
	A. Standard Breed					
	B. Morgan					
	C. American Saddle					
	D. Arabian					
	E. Thoroughbred					
	F. Belgian					
	G. Clydesdale					
V.	Selection	I				
	A. Breeder Replacement					
	B. Production					
	C. Show					

Misc. Livestock

		Level	Grade			
I.	Economic Importance in New Hampshire, Northeast and United States	I				
II.	Occupational Opportunities	I				
	A. Production					
	B. Instruction					
	C. Research					
	D. Extension					
	E. See Encyclopedia of Careers for Vocational Guidance					
III.	Description and Origin	I				
	A. Bees					
	B. Rabbits					
	C. Hamsters					
	D. Mink					
	E. Other					

01.01-01-02-00

	Level * I/S	Grade 9 10 11 12
Nutrition - Oriented to Animal Health		
I. Why and Where Used	S	
II. Nutritional Requirements	S	
III. Minerals	S	
IV. Vitamins	S	
V. Grains (see 01.02-02-00-00 and 01.01-01-00-01)	S	

I. Why and Where Used

- A. Production of energy for body tissue and muscular activity
- B. Maintenance and repair of body tissue
- C. Production of milk
- D. Development of fetus
- E. Development of male--bull, boar, rooster, etc.

II. Nutritional Requirements

- A. Energy producing vitamins
- B. Proteins
- C. Minerals
- D. Water
- E. Net Energy (Definition)
- F. Balancing Ration

III. Minerals

- A. Iron
- B. Phosphorous
- C. Calcium
- D. Iodine
- E. Cobalt
- F. Sodium Chlorate

IV. Vitamins

- A. A
- B. B
- C. C
- D. D
- E. E

V. Grains (see 01.02-02-00-00 and 01.01-01-00-01)

- A. Balancing Rations
- B. Mixing Basic Rations
- C. Special Mix--Medicated
  - 1. Animal
  - 2. Poultry
- D. Commercial (pellets, mash, etc.)
- E. Supplements

01.01-01-02-00
01.01-01-03-00
01.01-01-04-00

	Level	Grade			
	* I/S	9	10	11	12
VI. Forage	S				
A. Pasture					
B. Silage					
C. Haylage, Soilage					
D. Hay					
VII. Occupational Opportunities	I				
A. Instruction					
B. Research					
C. Extension					
D. See *Encyclopedia of Careers for Vocational Guidance*					
Genetics					
I. Mendels Contribution (see 01.01-02-04-00)	S				
II. Dominant and Recessive Genes	S				
III. Importance of Genetics and Animal Breeding	S				
IV. Importance of Sire and Dam	S				
V. Systems and Breeding	S				
A. Crossbreeding					
B. Purebred					
C. Artificial					
VI. Occupational Opportunities	I				
A. Instruction					
B. Research					
C. Extension					
D. See *Encyclopedia of Careers for Vocational Guidance*					
Physiology and Anatomy					
I. Analyzing the Cow's Udder--Its Structure and Development	S				
A. Evolution of the Mammary Gland					
B. The Mammary Gland of the Cow					

	Level	Grade			
	* I/S	9	10	11	12
C. The Shape of the Udder--External Appearance and Structure					
D. Internal Structure of the Udder					
1. The duct system					
2. The gland cistern					
3. Milk ducts					
4. The alveolus					
5. The circulatory system					
6. Veins					
7. The lymph system					
8. The nerve system					
E. Embryological Development					
F. Development During Pregnancy					
G. Causes of Udder Development					
H. Involution					
II. Improving Milk Secretion	S				
A. Milk Secretion					
1. The theory of					
2. Milk as the result of cell degeneration					
3. Milk as the result of cell metabolism					
4. A combination of any or all of these					
B. Facts About Lactation					
1. Endocrine factors					
2. When milk is secreted					
3. Pressure and milk secretion					
4. Equilibria between milk and blood					
C. Let-down of Milk					
III. Structure and functions of Male and Female Reproductive Systems	S				
A. Animals					
B. Poultry					
IV. Digestive Systems	S				
A. Animals					
B. Poultry					
V. Occupational Opportunities	I				
A. Instruction					

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Level * I/S   Grade 9 10 11 12

- B. Research
- C. Extension
- D. See Encyclopedia of Careers for Vocational Guidance

Animal Health

I. Recognizing the Common Diseases and Ailments S

- A. General Factors and Control of Diseases and Ailments
  - 1. General health change
  - 2. General health of herd or flock
  - 3. Prevention methods
    - a. vaccines
    - b. drugs
    - c. sanitation
  - 4. Treatment methods
    - a. drugs
    - b. veterinary care
- B. Dairy Cattle Diseases and Ailments
  - 1. Identification
  - 2. Cause
  - 3. Control
  - 4. Prevention
- C. Poultry Diseases and Ailments
  - 1. Identification
  - 2. Cause
  - 3. Control
  - 4. Prevention
- D. Other Livestock Diseases and Ailments
  - 1. Identification
  - 2. Cause
  - 3. Control
  - 4. Prevention

II. Recognizing the Common Parasites and Other Pests S

- A. General Factors and Control (See 01.01-02-07-00)

Level — Grade
* I/S — 9 10 11 12

1. General Health Change
2. General health of herd or flock
3. Prevention methods
   - a. disinfectants
   - b. cleanliness
   - c. care of newborn

4. Treatment methods (see 01.01-02-07-01)
   - a. sprays
   - b. dips
   - c. dust and powders
   - d. drugs
   - e. veterinary care

B. Dairy Cattle Parasites (see 01.01-02-07-01)

1. Identification
2. Cause
3. Control
4. Prevention

C. Poultry Parasites (see 01.01-02-07-01)

1. Identification
2. Cause
3. Control
4. Prevention

D. Other Livestock Parasites (see 01.01-02-07-01)

1. Identification
2. Cause
3. Control
4. Prevention

III. Care and Safety — S

A. Dairy and Beef Cattle

1. Health and Appearance
   - a. grooming
   - b. exercise
   - c. trimming hoofs
   - d. training horns
   - e. dehorning

2. Controlling Misbehavior
   - a. kicking
   - b. sucking
   - c. fence breaking

    d. viciousness

3. Care in Breeding
    a. gestation period
    b. estrus
    c. when to breed
    d. keeping breeding records
    e. sterility
    f. care of the dry cow
    g. care at calving

4. Difficulties Encountered in Parturation
    a. retained afterbirth
    b. congested udder
    c. milk fever
    d. ketosis

5. Care in Milking
    a. milking procedures
    b. milking the heifer
    c. drying-off cows
    d. leaking teats
    e. sore teats
    f. relationship of milking machine to udder disease

6. Why Cows Leave the Herd
    a. surplus stock
    b. poor producers
    c. old age
    d. accidents
    e. deaths
    f. diseases
    g. sterility

B. Poultry

1. Culling the Flock
    a. principle of selection
    b. when to cull
    c. selecting pullet stock

2. Maintaining sanitary conditions
3. Debeaking
4. Vaccinating
5. Housing Conditions
    a. dry litter
    b. drafts
    c. temperature

	Level	Grade
	* I/S	9 10 11 12

6. Handling

C. Other Livestock--Sheep, Swine, Horses, etc.

1. Care of the female
    a. at time of conception
    b. through pregnancy
    c. after pregnancy

2. Care of the male
    a. when used as a stud
    b. when not being used as a stud

3. Care of the newborn
    a. at birth
    b. several weeks old

4. Safety in the handling of animals
    a. stud animals
    b. new mothers
    c. standard equipment needed
    d. common sense

5. Kinds and amounts of bedding

6. Shoeing
    a. livestock
    b. safety in shoeing
    c. purpose
    d. procedure
    e. equipment needed

Production Management

Feed Practices

I. Dairy Cattle — S

A. Feeding Calves

1. Colostrum
2. Whole Milk
3. Skim Milk
4. Milk Substitutes
5. Hay
6. Silage
7. Grain
8. Water

	Level * I/S	Grade 9 10 11 12
B. Feeding Heifers (young stock)		
1. Roughage		
2. Concentrates		
3. Pasture--Grazing		
4. Additives		
5. Supplements		
C. Feeding Milking Herd		
1. Material Available		
2. Season		
3. Daily Schedule		
4. Additives		
5. Stage of Lactation		
6. Supplements		
D. Pregnant Cows		
E. Sire		
1. Active		
2. Inactive		
II. Poultry	S	
A. Chick, Pullets, and Production Birds		
1. Methods Used		
a. feeds		
b. medication		
c. grit or calcium		
2. Feeding Schedule and Routines		
a. quantity		
b. frequency		
c. feeder location		
3. Space Requirements		
a. feeding		
b. water		
B. Other Fowl		
1. Ducks		
2. Turkeys		
3. Game Birds		
4. Show Birds		

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	Level * I/S	Grade 9	 10	 11	 12
III. Other Livestock	S				
A. Beef					
1. Calves					
2. Feeders					
3. Breeding Stock					
4. Steers					
B. Sheep					
1. Lambs					
2. Breeding Stock					
3. Fattening					
C. Swine					
1. Piglets					
2. Breeding Stock					
3. Commercial Meat Production					
D. Horses					
1. Foals					
2. Breeding Stock					
3. Pleasure					
4. Racing					
5. Draft					
E. Others, ie. Bees, Mink, Goats, Fish, etc.					
Housing Practices					
I. Requirements of Building Facilities	S				
A. Labor Saving					
B. Sanitation					
C. Durability					
D. Attractiveness					
II. Types of Buildings	S				
A. One Story					
B. Two Story					
C. Basement					
D. Lean-to					
E. Round					
F. Free Stall Loose Housing					
G. Mechanical Feeding					
H. Pole					

	Level	Grade			
	* I/S	9	10	11	12
III. Planning the Buildings	S				
A. Reading Blue Prints					
B. Providing Efficient Disposal of Waste					
1. Barn Cleaners					
2. Storage					
a. solid					
b. liquid					
C. Local, State and Federal Regulations					
D. Providing Adequate Ventilation					
E. Mechanization					
F. Automation					
G. Lighting					
IV. Special Features and Facilities	S				
A. Feeding Systems					
1. Bulk					
2. Automated Feeding Systems					
B. Paved Yards					
C. Breeding Racks or Ramp					
D. Specialized Stalls					
1. Maternity or Isolation					
2. Calf Pens					
E. Milking Systems					
F. Livestock Squeeze (treatment racks)					
Other Production Management (specify)					
I. Marketing Livestock (Beef, Sheep, Swine and Fowl) see 01.04-01-02-00	S				
A. Methods of Marketing Livestock					
1. Terminal Markets					
2. Auctions					
3. Direct to Packers					
4. Local Dealers					
5. Others					

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01.01-01-99-00

	Level * I/S	Grade 9 10 11 12
B. Preparing and Shipping Livestock		
1. Preventing Losses		
a. bruises		
b. crippling		
c. death		
2. Number of Animals Per Truck or Railroad Car		
a. rules and regulations		
3. Kinds of Bedding for Transit (see 01.01-01-05-00 part 3)		
4. Shrinkage		
C. Market Classes and Grades		
1. Definitions		
2. Factors Affecting Class		
a. use of animal		
b. value of animals		
3. Factors Affecting Grades		
a. conformation		
b. finish		
c. quality		
D. Other Marketing Considerations		
1. Cyclical Trends		
2. Seasonal Changes		
a. when to buy		
b. when to sell		
3. Dockage		
4. Livestock Marketing Costs		
5. Contract		
E. Parity and Parity Prices		
II. Marketing Dairy and Livestock Products	S	
A. Methods of Marketing		
B. Market Classes and Grades		
C. Other Marketing Considerations		

Plant Science 01.01-02-00-00

Crops 01.01-02-01-00

	Level * I/S	Grade 9 10 11 12
I. Classification of Plants	I	

A. Woody Plants

1. Forestry
   a. hardwood
   b. softwood

2. Ornamentals
   a. needle evergreens
   b. broad leaf evergreens
   c. deciduous

3. Tree Fruits
   a. Pomes (Pyrus)
      (1) apples
      (2) pears
   b. Stone Fruit (Prunus)
      (1) peaches
      (2) plums
      (3) cherries

4. Brush Fruits
   a. blueberries

5. Small Fruits
   a. strawberries
   b. cane fruit
   c. cranberries

B. Non-Woody Plants

1. Vegetable
   a. root
   b. stem
   c. leaf
   d. flower
   e. fruit
   f. seed

2. Forage
   a. grasses
   b. legumes
   c. grains
   d. roots

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	Level * I/S	Grade 9 10 11 12
Field and Forage Crop		
I. Economic Importance in New Hampshire, Northeast and United States	I	
II. Occupational Opportunities	I	
A. Farm Fieldman		
B. Extension Specialist		
III. Types	S	
A. Managing the True Clovers		
1. Uses of the Clovers		
2. Clover in the Rotation		
3. Species of Clover		
a. Red Clover		
(1) medium		
(2) mammoth		
b. Alsike		
c. White		
d. Ladino		
e. Crimson		
4. Culture of Clover		
a. seedbed preparation		
b. fertilization (see 01.01-02-03-00)		
c. inoculation		
d. methods and rate of planting		
5. Clovers in Mixtures		
a. diseases		
b. insects (see 01.01-02-06-00) controlling each		
B. Managing Alfalfa		
1. Soil and Climatic Requirements (see 01.01-02-02-00)		
2. Types of Alfalfa		
a. Common		
b. Turkestan		
c. Variegated		
d. Nonhardy		
e. Yellow Flowered		

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3. Selecting a variety

4. Culture of alfalfa
   - a. inoculation
   - b. preparation of the seedbed
   - c. fertilization (see 01.01-02-03-00)
   - d. methods and rates of sowing
   - e. causes of winterkill
   - f. when to cut for hay
   - g. alfalfa seed production

5. Insects of alfalfa
   - a. Alfalfa aphid
   - b. Alfalfa weevil

6. Diseases of alfalfa
   - a. Bacterial wilt
   - b. Alfalfa leaf spot

C. Managing Birdsfoot Trefoil

1. Importance of trefoil

2. Soil and climatic requirements (see 01.01-02-02-00)

3. Methods and rates of sowing

4. Fertilization

5. Uses
   - a. hay
   - b. pasture
   - c. seed

6. Insects and diseases (see 01.01-02-06-00)

D. Managing the Perennial Forage Grasses

1. Brome Grass
   - a. importance and distribution
   - b. soil and climatic requirements
   - c. types of brome grass
     - (1) Southern
     - (2) Northern
   - d. methods and rates of sowing
   - e. fertilization

- f. uses
    - (1) hay
    - (2) pasture
    - (3) grass silage

- g. insects and diseases

2. Timothy
    - a. importance and distribution
    - b. soil and climatic requirements
    - c. culture of Timothy
    - d. rate and method of sowing
    - e. fertilization
    - f. uses
        - (1) hay
        - (2) pasture
        - (3) silage

3. Reed Canary Grass
    - a. importance and distribution
    - b. soil and climatic requirements
    - c. culture of Reed Canary Grass
    - d. seedbed preparation
    - e. rate and method of sowing
    - f. fertilization (see 01.01-02-03-00)
    - g. uses
        - (1) hay
        - (2) pasture
        - (3) silage
        - (4) soil conservation

4. Orchard Grass
    - a. importance
    - b. soil and climatic requirements (see 01.01-02-02-00)
    - c. seedbed preparation
    - d. rates and methods of sowing
    - e. fertilization
    - f. uses
        - (1) hay
        - (2) early pasture
        - (3) grass silage

5. Redtop
    - a. importance
    - b. soil and climatic requirements
    - c. seedbed preparation
    - d. rate and methods of sowing
    - e. fertilization

- f. uses
  - (1) hay
  - (2) in the mixture
  - (3) pasture

6. Kentucky Bluegrass

7. Fescues

8. Annual Grasses (Oats, Wheat, Rye)
   - a. emergency crops
   - b. green manure
   - c. cover crops
   - d. silage
   - e. grain

E. Managing Pastures

1. Kinds of pastures
   - a. natural or native grass
   - b. permanent pastures
   - c. rotation of pastures
   - d. annual pastures
   - e. supplement pastures

2. Economics of pastures

3. Pasture mixtures

4. Fertilizing pastures
   (see 01.01-02-03-00)

5. Pasture renovation

6. Woodland pastures

7. Dangers to pastures
   - a. drought
   - b. winterkill
   - c. poisonous plants
   - d. insects (see 01.01-02-06-00)
   - e. diseases (see 01.01-02-06-00)
   - f. overgrazing

F. Hay Making

1. Factors which affect the quality of hay
   - a. soil
   - b. conditions of growth
   - c. climatic conditions

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- d. species of forage growth
- e. insects and diseases
- f. curing and storing
- g. stage of maturity at harvest

2. Determining quality of hay
    - a. importance of leafiness
    - b. color
    - c. odor
    - d. other (mold, mildew, weeds, etc.)

3. Methods of curing
    - a. field curing
    - b. artificial curing

G. Making Grass Silage

1. Advantages of grass silage

2. Disadvantages of grass silage

3. Crops for grass silage
    - a. grasses
    - b. legumes
    - c. cereals

4. When to cut

5. Preservation methods

6. Harvesting--length to cut

7. Silo requirements--estimating the capacity of a silo

H. The Corn Enterprise

1. Uses of corn

2. Types of corn
    - a. dent corn
    - b. flint corn
    - c. popcorn
    - d. sweet corn
    - e. soft corn
    - f. pod corn

3. Climatic and soil requirements

4. Hybrid corn
    - a. selecting Hybrid strains

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5. Culture of corn
    a. fertilization (see 01.02-04-00-00)
    b. tillage
    c. cultivation

6. Corn for silage
    a. how silage is made
    b. when to make silage
    c. harvesting for silage

7. Diseases of corn
    a. corn smut
    b. corn rot
    c. bacterial wilt

8. Insects of corn
    a. European corn borer
    b. Armyworms
    c. Nematodes

9. Controlling insects and diseases of corn

10. Others

11. Rotating crops
    a. organic matter and its function in soil
    b. sources of organic matter
    c. definition of crop rotation
    d. benefits of proper rotation
        (1) increased yield
        (2) maintenance of organic matter
        (3) increase of nitrogen
        (4) efficient utilization of soil nutrients
        (5) reduced erosion loss
        (6) control of insects, weeds, and diseases
    e. developing a crop rotation

12. Controlling weeds
    a. importance of weeds
        (1) reduction of yields
        (2) reduction of quality
        (3) poisonous weeds
        (4) host of diseases and insects
        (5) reduced land value
    b. types of weeds
        (1) annual
        (2) biennials
        (3) perennials

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c. methods of spreading weed seeds
    (1) contamination in seed grains
    (2) wind
    (3) water
    (4) animal and humans

d. weed control (see 01.01-07-07-00 and 01.02-03-00-00)
    (1) cultivation
    (2) smothering crops
        (a) Buckwheat
        (b) Millet
        (c) Sudan Grass
        (d) Others
    (3) chemicals
        (a) Salts
        (b) Amines
        (c) Esters
    (4) methods of applying weed sprays
    (5) precautions of using sprays

Tree Fruit and Nut Crop

I. Economic Importance in New Hampshire, Northeast and United States — I

II. Occupational Opportunities — I

    A. Orchard Farmer
    B. Nut Grower
    C. Fruit Picker

III. Geographic Areas of Production — S

    A. General Areas
    B. Areas of Specialization
    C. Factors Concerning Geographic Areas

        1. Climate
            a. temperature
            b. day length
            c. moisture

        2. Soils

        3. Genetic limitations of crops

        4. Markets

	Level	Grade			
	* I/S	9	10	11	12
IV. Classification and Identification (see 01.01-02-01-00)	S				
V. Types of Tree Fruit	S				
A. Pome Fruits					
1. Apple					
2. Pear					
B. Drupe Fruits					
1. Peach					
2. Plum					
3. Apricot					
4. Cherry					
5. Almond					
C. Citrus Fruits					
1. Orange					
2. Lemon					
3. Grapefruit					
4. Lime					
D. Nut Fruits					
VI. Establishing the Orchard	S				
A. Selecting Soil					
B. Selecting and Preparing Site					
C. Selecting Varieties					
D. Planting					
1. Depth					
2. Time					
3. Spacing					
VII. Cultural Practices	S				
A. Fertilization					
B. Mulching					
C. Irrigation					
D. Pruning and Training					
1. Determining growth and bearing habits					
2. Determining when to prune					
3. Selecting method to use					
4. Pruning (young trees--old trees)					
5. Protecting pruning wounds					
6. Disposing of prunings					

	Level	Grade			
	* I/S	9	10	11	12
E. Controlling Pests and Diseases (see 01.02-01-00-00)					
1. Identification of insects and diseases					
2. Spraying					
a. selecting materials					
b. mixing materials					
c. Spraying schedules					
d. applying materials					
3. Rodent and deer					
a. recognizing damage done					
b. control procedures					
F. Equipment					
1. Essential--Need					
2. Use					
3. Storing and care					
VIII. Harvesting	S				
A. Factors Determining When to Harvest					
B. Methods of Harvesting					
C. Handling and Care					

Small Fruit Crops and Grapes

	Level	Grade			
I. Economic Importance in New Hampshire, Northeast and United States	I				
II. Occupational Opportunities	I				
A. Grower					
B. Production Foreman					
C. Picker					
III. Types	S				
A. Strawberries					
1. Varieties					
B. Blueberries					
1. Varieties					
C. Cane Fruit					

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01.01-02-01-04

	Level	Grade			
	* I/S	9	10	11	12
D. Grapes					
E. Other					
1. Cranberries					
IV. Establishing Small Fruit Crops and Grapes	S				
V. Cultural Practice	S				
A. Fertilization					
B. Mulching					
C. Irrigation					
D. Training and Pruning					
E. Controlling Pests and Diseases					
1. Identification					
2. Spraying					
F. Equipment					
1. Essential--need					
2. Use					
3. Storing and care					
VI. Harvesting	S				
A. Factors Determining When to Harvest					
B. Methods					
C. Handling and Care					
VII. Storage	S				
VIII. Packaging and Processing	S				
IX. Marketing	S				
Vegetable Crops					
I. Economic Importance in New Hampshire, Northeast and United States	I				
II. Occupational Opportunities	I				
A. Vegetable Grower					
B. Plant Breeder					

	Level * I/S	Grade 9 10 11 12
C. See Encyclopedia of Careers for Vocational Guidance		
III. Geographic Areas of Production	S	
A. General Areas B. Areas of Specialization C. Factors Concerning Geographic Areas 1. Climate a. temperature b. day length c. moisture 2. Soils 3. Genetic limitations of crops 4. Markets		
IV. Methods of Classification of Vegetable Crops	S	
A. Botanical 1. Annuals 2. Perennials B. Temperature 1. Warm season crops 2. Cool season crops C. Parts of Plant Utilized 1. Root 2. Stem 3. Leaf 4. Fruit 5. Flower D. Cultural Methods 1. Root crops (turnip, beet, carrot, radish) a. cultivar (name of cultivated varieties) b. direct seeded c. frost or cold resistance d. control of root insects (at time of planting) e. soils (1) pH (2) structure (3) fertility (4) moisture		

2. Solanoceous (Tomato, Pepper, Egg Plant)
    - a. cultivar (name of cultivated varieties)
    - b. transplants
    - c. susceptibility to frost
    - d. soils
        - (1) pH
        - (2) structure
        - (3) fertility
        - (4) moisture
    - e. control of insects and diseases

3. Vine crops (Cucumbers, Muskmelons, Squash, Watermelons)
    - a. cultivar (name of cultivated varieties)
    - b. direct seeded or transplants
    - c. susceptibility to frost
    - d. soils
        - (1) pH
        - (2) structure
        - (3) fertility
        - (4) moisture
    - e. control of insects and diseases
    - f. using plastic mulch

4. Salad and cole crops (Lettuce, Kale, Celery, Spinach, Chard, Endive, Parsley, Cabbage, Cauliflower, Broccoli, Kohlrabi, Brussels Sprouts, Chinese Cabbage)
    - a. cultivar (name of cultivated varieties)
    - b. transplants and direct seeding
    - c. frost resistant
    - d. soil
        - (1) pH
        - (2) structure
        - (3) fertility
        - (4) moisture
    - e. control of root diseases
    - f. control of insects and diseases

5. Bulb crops (Onion, Garlic, Chives)
    - a. cultivar (name of cultivated varieties)
    - b. sets or transplants
    - c. soil
        - (1) pH
        - (2) structure
        - (3) fertility
        - (4) moisture

6. Potato
    a. cultivar (name of cultivated varieties)
    b. seed pieces
    c. soil
        (1) pH
        (2) structure
        (3) fertility
        (4) moisture
    d. control of insects and diseases

7. Peas
    a. cultivar (name of cultivated varieties)
    b. direct seeded
    c. soil
        (1) pH
        (2) structure
        (3) fertility
        (4) moisture
    d. control of insects and diseases

8. Beans
    a. cultivar (name of cultivated varieties)
    b. direct seeded
    c. frost susceptibility
    d. soil
        (1) pH
        (2) structure
        (3) fertility
        (4) moisture
    e. control of insects and diseases

9. Sweet corn
    a. cultivar (name of cultivated varieties)
    b. direct seeded
    c. soil
        (1) pH
        (2) structure
        (3) fertility
        (4) moisture

V. Cultural Requirements S

A. Seeding (rows and hills)

B. Transplanting

1. Vigorous plants (non stunted)
    a. use of starter solutions

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C. Cultivation--When Needed

D. Chemical Weed Control

  1. Pre-plant
  2. Pre-emergence
  3. Post-emergence

E. Fertilization

  1. Broadcast, etc.
  2. Recommendations
  3. Dry or liquid fertilizers

F. Insect Control

G. Disease Control

H. Mulching

I. Irrigation

J. Rotation, Succession, and Intercropping

	Level	Grade
VI. Harvesting	S	

A. Hand Harvesting

B. Mechanical Harvesting

  1. Field adaptation
  2. Crop adaptation
    a. uniformity
    b. maturity

C. Market Demands

D. Seasonality of Crop

E. Environmental Factors

  1. Drought
  2. Frost
  3. Hail, hurricane, etc.

Farm Forestry (see 01.07-02-00-00)

Other Crops (specify)

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	Level	Grade			
	* I/S	9	10	11	12
Soils (see 01.06-04-00-00)					
I. Definition of Soil	I				
A. City and Suburban					
B. Commercial and Agricultural					
II. Origin and Formation	I				
A. Rocks					
B. Weathering					
C. Transportation and Deposition					
D. Soil Horizons					
1. Layers a. top soil b. sub soil c. substratum					
2. Layer depths					
III. Properties of Soil	I				
A. Physical Properties of Soil					
1. Texture 2. Structure 3. Color 4. Temperature 5. Organic matter 6. Water content and holding capacity 7. Water movement 8. Plant nutrients 9. Air movement (Aeration)					
B. Chemical Properties of Soil					
1. Acidity 2. Alkalinity 3. pH					

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C. Biological Properties of Soil					
1. Microorganisms					
2. Plant organisms					
3. Animal organisms					
4. Organic decomposition					
IV. Soil Classifications	I				
A. By Texture					
1. Gravel					
2. Sand					
3. Loam					
4. Clay					
5. Silt					
B. By Use					
1. Agricultural					
2. Commercial					
3. Industrial					
4. Recreational					
C. Others					
1. Slope					
2. Drainage					
3. Color					
V. Major Components of Soil	I				
A. Components					
1. Mineral					
2. Organic					
3. Water					
4. Air space					
B. Essential Elements From the Soil					
1. Macronutrients (N,P.K, others)					
2. Micromutrients (Fe,Mn,S, others)					
VI. Types of Soils	I				
A. Mineral Soils					

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	Level * I/S	Grade 9	10	11	12
1. Sands					
2. Sandy loams					
3. Loams					
4. Silt loams					
5. Clay loams					
B. Organic Soils (Muck or Peat)					
1. Low lime mucks					
2. High lime mucks					
3. Alkaline mucks					
C. Saline Soils					
D. Alkaline Soils					
VII. Soil Improvement and Maintenance	I				
A. Tillage					
B. Crop Rotation					
C. Fertility and Productivity					
1. Purpose					
2. Organic a. plant b. animal					
3. Commercial/inorganic					
D. Erosion Controls					
E. Drainage					
F. Irrigation					
G. Soil Testing					

Nutrition--Oriented to Plant Science (see 01.02-04-00-00)

	Level * I/S	Grade 9	10	11	12
I. Importance of Nutrition	I				
II. Occupational Opportunities (see Encyclopedia of Careers for Vocational Guidance)	I				

	Level	Grade			
	* I/S	9	10	11	12
III. Knowing and Correcting Soil Problems	I				
A. Best pH Range for Crops					
1. Acid					
2. Neutral					
3. Alkaline					
B. Lime Requirement of Soil Types					
C. Effects of Liming					
IV. Functions of Plant Food Elements	I				
A. Nitrogen					
B. Phosphate					
C. Potash					
D. Magnesium					
E. Sulfur					
F. Calcium					
G. Boron					
H. Others--Trace Elements					
V. Growth and Nutrient Up-Take	S				
A. Plant Response					
B. Rate of Nutrient Removal					
1. Grains					
2. Forage crops					
a. grass					
b. legumes					
3. Fruits					
4. Vegetables					
5. Other Crops					
VI. Hunger Signs and Symptons	S				
VII. Checking or Confirming Plant Food Deficiencies	I				
A. Soil Testing					
1. Sampling					
2. Methods					

	Level * I/S	Grade 9	10	11	12
B. Plant Tissue Testing					
C. Field Testing					
1. Demonstration or Trial Plots					
VIII. Importance and Role of Environmental Factors in Plant Nutrition	I				
A. Moisture					
B. Sun					
C. Temperature					
Genetics--Oriented to Plant Science					
I. Importance of Genetics	I				
A. Mendel					
II. Occupational Opportunities	I				
III. Cells and Heredity	S				
A. Cell Structure					
B. Cell Reproduction					
C. Mitosis					
D. Genes and Chromosomes					
E. Meiosis					
F. Spermatogenesis					
G. Oogenesis					
H. Gametogenesis					
IV. Probability and Mendelian Ratios	S				
A. Dominant Genes					
B. Recessive Genes					
C. Segregation and Probability					
D. Chi-Square					
E. Lethal Genes					
F. Inheritance					
G. Phenotype					
V. Linkage, Crossing Over, and Chromosome Maps	S				
VI. Sex Chromosomes and Sex Linkage	S				
A. X O Mechanism					
B. X Y Mechanism					
C. Sex Linkage					

	Level	Grade			
	* I/S	9	10	11	12
VII. Sex Determination	S				
A. Y Chromosomes					
B. Male Haplordy					
C. Single Genes					
D. External Environment					
E. Hormones					
F. Sex Influencial Traits					
G. Sex Limited Traits					
H. Gynandromorphs					
VIII. Chromosome Structural	S				
A. Breakage and Joining					
B. Salivary Gland					
C. Giant Chromosomes					
D. Deficiencies					
E. Duplication					
F. Inversions					
G. Translocations					
H. Position Effect					
IX. Chromosome Numbers	S				
A. Aneuplordy					
B. Euplordy					
C. Polyplordy					
1. Evolution					
2. Induced					
3. Experimental production					
4. Practical application					
D. In Man					
X. Mutations	S				
A. Units					
B. Effects on Phenotype					
C. Somatic					
D. Germinal					
E. Spontaneous					
F. Mutable and Mutator Gene					
G. Induced					
H. Mutagenic Agents					
I. Detection					
J. Balanced Lethals					
K. Mutation and Man					

		Level	Grade			
		* I/S	9	10	11	12
XI.	Gene Chemistry and Gene Action	S				
	A. Chemical Nature of Genes					
	B. Replication of Genes					
	C. Gene Action					
	D. Pigments of Insect and Plants					
	E. Genes and Enzymes in Newrospra					
XII.	Protein Synthesis and Genetic Coding	S				
	A. Protein Synthesis					
	B. RNA					
	C. Decoding					
XIII.	Recombination in Bacteria and Viruses	S				
XIV.	Alleles and Complex Loci	S				
	A. Rh and Other Blood Factors					
XV.	Physiological Genetics	S				
XVI.	Multiple Gene Inheritance	S				
	A. Polygenes Theory					
	B. Skin Color in Man					
	C. Estimating the Number of Gene Differences					
	D. Quantitative Inheritance					
XVII.	Population Genetics	S				
	A. Equilibrium					
	B. Factors Influencing Line of Genes Frequency					
	C. Evolution					
XVIII.	Systems of Mating	S				
	A. Self-Fertilizing Plants					
	B. Inbreeding					
	C. Outbreeding					
	D. Crossbreeding					
	E. Heterosis in Plants					
XIX.	Practical Application	S				
	A. Animal Breeding					
	B. Lethal Genes					
	C. Plant Breeding					
	D. Methods and Accomplishments					

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	Level * I/S	Grade 9	10	11	12
Physiology--Oriented to Plant Science					
I. Importance of Physiology	I				
II. Occupational Opportunities (see *Encyclopedia of Careers for Vocational Guidance*)	I				
III. How Plants Grow and Reproduce	I				
A. Cell Structure and Function					
B. Phases of Growth					
1. Vegetative					
2. Reproductive					
C. Rates of Growth					
D. Propagation					
1. Sexual					
a. seed					
2. Asexual					
a. cuttings					
b. grafting					
c. transplanting					
d. rooting					
e. tubers					
f. budding					
g. bulbs					
h. corms					
i. runners					
j. layage					
k. separation					
IV. Structure of the Plant	I				
A. The Root					
1. Structure					
2. Functions of the Root					
a. anchorage					
b. absorption of water and nutrients					
c. storage					
B. The Stem					

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1. Structure (mature tree stem)
    a. bark
    b. cambium
    c. xylem
    d. phloem

2. Specialized "stems"

    a. rhizomes
    b. stolons
    c. tubers
    d. fleshy stems

3. Functions of the stem
    a. support
    b. transportation of water and nutrients between roots and leaves
    c. storage

C. The Leaf

1. Leaf structure and modification
    a. stomata
    b. palisade cells
    c. variations
        (1) compound leaves
        (2) tendrils
    d. leaf peticles

2. Functions of the leaf
    a. food manufacturing

D. The Flower

1. Typical flower structure
    a. variations
        (1) incomplete
        (2) imperfect
        (3) dioecious
        (4) monoecious

2. Compound Flowers
    a. various types
    b. "singles" and "doubles"

3. Flower production in relation to use
    a. fruit crops
    b. flower crops
    c. vegetable crops

E. The Fruit and Seeds

1. Development of flower to seed

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   2. Growth of seed

   3. Development of the ovary

   4. Types of fruit
      a. berry
         (1) hesperidium
         (2) pepo
      b. drupe
      c. aggregate
      d. pome
      e. multiple
      f. caryopsis
      g. nut

   5. Fruit structure and growth

  F. Buds

  G. Bulbs

V. Composition of the Plant — S

  A. Carbohydrates

   1. Lignin
   2. Cellulose
   3. Starch
   4. Sugar

  B. Fats
  C. Proteins
  D. Minerals
  E. Vitamins
  F. Water

VI. Environmental Factor Affecting Plant Growth — S

  A. Light
  B. Temperature
  C. Moisture and Relative Humidity
  D. Aeration

Entomology

I. Importance of Entomology — I

  A. Why Study Insects

	Level	Grade			
	* I/S	9	10	11	12
II. Career Opportunities in Entomology	I				
III. Acquaintance With Insects	S				

- A. Identification
  - 1. Scientific names
    - a. Orthoptera (Grasshoppers, Roaches and Crickets)
    - b. Isoptera (Termites)
    - c. Mallophaga and Anaplura (Lice)
    - d. Homoptera (Aphids, Leafhoppers, and Scales)
    - e. Hemiptera (True bugs)
    - f. Coleoptera (Beetles)
    - g. Lepidoptera (Butterflies and Moths)
    - h. Diptera (Flies and Mosquitoes)
    - i. Hymenoptera (Wasps, Bees and Ants)
    - j. Siphonaptera (Fleas)
    - k. Miscellaneous groups
  - 2. Description
    - a. size
    - b. color
    - c. mouth parts (chewing, sucking, lapping)
    - d. number of wings
- B. Habitat
  - 1. Air
  - 2. Soil
  - 3. Water
  - 4. In or on host
- C. Source of food
  - 1. Growing crops and vegetation
    - a. chew plants or suck juices
    - b. cause malformations
    - c. transmit disease organisms
  - 2. Man and animals
    - a. annoy
    - b. inject venoms
    - c. live on or in body
    - d. transmit disease organisms
  - 3. Manufactured and stored products
    - a. eat
    - b. contaminate

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	Level * I/S	Grade 9 10 11 12
D. Life Cycles		
1. How does it spend the winter		
2. Where does it spend the winter		
3. Kinds of life cycles		
a. complete metamorphosis (four stages)		
(1) egg		
(2) larva		
(3) pupa		
(4) adult		
b. incomplete metamorphosis (less than four)		
(1) egg		
(2) nymph		
(3) adult		
IV. Economic Importance	I	
A. Pest		
B. Beneficial		
C. Questionable		
V. Control for Pests	S	
A. Stomach Poison		
B. Contact Application		
C. Residual Application		
D. Fumigant		
E. Attractants		
F. Repellents		
G. Cultural (crop rotation, sanitation, resistant varieties)		
H. Biological (predators, parasites)		
I. Legal (inspection, quarantine)		

Pest Control

I. Principles of Pest Control	S	
A. General Pest Problems		
B. How Pest Problems Develop		
C. Man's Attempt to Overcome Pests		

	Level * I/S	Grade 9 10 11 12
D. Identification of Various Types of Pests		
1. Weeds		
2. Insects		
3. Mites and ticks		
4. Disease organisms a. bacteria b. viruses c. fungi		
5. Rodents		
6. Nematodes		
7. Mollusks (snails and slugs)		
II. Use of Pesticides	S	
A. How Poisonous are Pesticides		
B. Out-of-Date Sources of Pesticide Information		
C. How to Calculate Dosage and Mix Pesticides		
1. Formulations a. emulsifiable concentrates (dips and sprays) b. wettable powders (dips and sprays) c. dusts d. granules and pellets e. aerosols f. fumigants g. other formulations		
2. Mixing of chemical and diluent		
3. Useful formulas		
4. Useful tables and conversion factors		
D. Types of Pesticide Application Equipment and Their Calibration		
1. Sprayers a. types of sprayers		

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b. parts of the sprayer
(1) pump (centri fugal, piston and roller)
(2) tank agitator
(3) filters
(4) pressure regulator
(5) pressure gauge
(6) nozzles
c. preparing a sprayer for use
d. calibrating a sprayer and procedure used
e. how to figure for band spraying
f. adjusting the spray rate
g. precautions
h. maintenance and storage

2. Spreaders
a. calibration - factors to consider
b. tractor speed or ground speed of spreader
c. maintenance and storage

3. Hand or knapsack sprayers
a. calibrating hand sprayers
b. maintenance and storage

E. Respirators and Other Protective Devices

1. Respirators with face-mounted cartridges

2. Supplied air respirator

3. Gas mask canisters

F. Keeping Records of Pesticides Used

III. Storage, Transportation and Disposal   S

A. Storage of Pesticides

B. Precautions for Transporting Toxic Chemicals

1. Care of pesticides and chemicals in transport
a. containers
b. temperatures
c. accidents
(1) fire
(2) spills
(3) contamination

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	Level * I/S	Grade 9	 10	 11	 12
C. Disposal of Empty Containers and Old or Unneeded Pesticides					
IV. First Aid for Poisoning	S				
A. Accidental Poisoning					
1. Swallowed poison a. do not cause vomiting if: b. cause vomiting if: c. patient unconscious or having fits d. petroleum product swallowed e. corrosive poison swallowed					
2. Poison in eye (or chemical burn)					
3. Poison on skin (or chemical burn)					
4. Inhaled poison (dust, vapors, gas)					
5. Supplemental treatment and useful aids a. treatment for shock b. artificial respiration c. useful antidotes and aids					
B. Preventing Accidental Poisoning					
V. Dictionary of Pesticide Terms	S				

Insecticides and Acaricides

	Level * I/S	Grade 9	 10	 11	 12
I. Definition (see 01.02-01-00-00)	S				
II. Considerations for Commonly Used Products (malathion, rotonone, chlordane, diazinon, dibrom, etc.)	S				
A. Common Name B. Some Trade Names C. Chemical Name D. Developed By E. Type of Compound F. Nature of Compound G. General Usage H. Toxicity I. Persistence or Residual Period J. Hazards K. Compatibility L. Tolerances M. Harvest Intervals					

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01.01-02-07-04

	Level	Grade			
	* I/S	9	10	11	12
Fungicides					
I. Definition (see 01.02-01-00-00 - Agricultural Chemicals, Part III)	S				
II. Considerations for Commonly used Products (captan, maneb, sulfur, cybrex, etc.)	S				
A. Common Name					
B. Some Trade Names					
C. Chemical Name					
D. Developed By					
E. Type of Compound					
F. Nature of Compound					
G. General Usage					
H. Toxicity					
I. Persistence or Residual Period					
J. Hazards					
K. Compatibility					
L. Tolerances					
M. Harvest Intervals					
Herbicides and Growth Regulators					
I. Definition (see 01.02-01-00-00 - Agricultural Chemicals, Part III)	S				
II. Considerations for Commonly used Products (atrazine, 2,4,-D, dowpon, simazine, 2,4,5-T, etc.)	S				
A. Common Name					
B. Some Trade Names					
C. Chemical Name					
D. Developed By					
E. Type of Compound					
F. Nature of Compound					
G. General Usage					
H. Toxicity					
I. Persistence or Residual Period					
J. Hazards					
K. Compatibility					
L. Tolerances					
M. Harvest Intervals					
Rodenticides and Other Pesticides					
I. Definition (see 01.02-01-00-00 - Agricultural Chemicals, Part III)	S				

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	Level * I/S	Grade 9	10	11	12
II. Considerations for Commonly used Products (strychnine, warfarin, arsenic, trioxide, etc.)	S				
A. Common Name					
B. Some Trade Names					
C. Chemical Name					
D. Developed By					
E. Type of Compound					
F. Nature of Compound					
G. General Usage					
H. Toxicity					
I. Persistence or Residual Period					
J. Hazards					
K. Compatibility					
L. Tolerances					
M. Harvest Intervals					

Fumigants and Nematocides

I. Definition (see 01.02-01-00-00 - Agricultural Chemicals, Part III)	S				
II. Considerations for Commonly used Products (methyl bromide, MIT, thionazine, etc.)	S				
A. Common Name					
B. Some Trade Names					
C. Chemical Name					
D. Developed By					
E. Type of Compound					
F. Nature of Compound					
G. General Usage					
H. Toxicity					
I. Persistence or Residual Period					
J. Hazards					
K. Compatibility					
L. Tolerances					
M. Harvest Intervals					

Marketing (see 01.01-04-00-00, 01.02-01-00-00,
01.04-01-00-00, 01.05-01-00-00, 01.06-01-00-00,
01.07-01-00-00)

Other Plant Science (specify)

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	Level * I/S	Grade 9	10	11	12
Farm Mechanics (see 01.03-00-00-00)					
Farm Business Management					
I. Importance of Good Management	I				
II. Occupational Opportunities	I				
A. Production					
1. Herdsman					
2. Farm manager					
B. Instruction					
C. Extension					
D. Research					
E. See Encyclopedia of Careers for Vocational Guidance					
III. Decision-making Process	I				
A. What Makes a Successful Manager					
B. Classification of Decision					
C. Problems Faced by Farm Manager					
D. Tools of Farm Management					
IV. Occupation of Farming	I				
A. Returns of Farming					
B. Commercially Operated Farms					
C. What is the Future of the Family Farm					
V. Economic Principles	S				
A. Diminishing Returns					
B. Marginal Analysis					
C. Fixed and Variable Costs					
D. Average and Marginal Cost Analysis					
E. Substitution Principles					
F. Returns to Size					
G. Equi-marginal Returns and Opportunity Costs					
H. Inadequate Information					
I. Other Economic Principles					

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	Level	Grade			
	* I/S	9	10	11	12
Farm Accounts					
I. Purpose and Description	S				
A. Parts of A Farm Record System					
B. Purpose of Farm Records					
C. Valuation of the Farm Inventory					
D. Depreciation					
E. Neatness and Accuracy					
II. Income and Net Worth Statements	S				
A. Receipts and Expense Records					
B. Income Statement					
C. Net Worth Statement					
III. Analysis of the Completed Records	S				
A. Measures of Financial Success					
B. Measures of Capital Position					
C. Measures of Size					
D. Measures of Efficiency					
E. Analysis Procedures					
F. Enterprise Accounting					
G. Interpretation and Use of Enterprise Accounts					
H. Enterprise Records and Decision-making					
IV. Income Tax Management	S				
A. Business Deduction					
B. Reporting Income					
C. Avoiding Income Fluctuations					
D. Managing Personal Deductions					
E. Substituting Capital Gains for Ordinary Income					
Performance Records					
I. Types and Importance of Record	S				
A. Crop					
1. Principles of crop selection					
2. Development of cropping systems					
3. Economics of conservation					
4. Fertilizer practices					
5. Water management					
6. Interaction among inputs					

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B. Livestock

1. Selection of livestock enterprise
2. Use of principal resources
3. Risk and uncertainty
4. Size of enterprise
5. Operating decisions
6. Markets and the timing of production
7. Cyclical price changes

C. Labor

1. Objectives of labor management
2. Labor inputs on commercial farms
3. Labor productivity
    a. quantity of labor and capital fixed
    b. labor fixed, capital variable
    c. labor and capital variable
4. Calendar of operations

D. Machinery

1. Labor-capital relationships
2. New versus used machinery
3. Economizing on machinery investment
4. Size relationships
5. Type of machinery

Budgeting and Analysis

I. The Farm Budget — S

A. Total Farm Budget
B. Budget Comparison of Farm Organizations
C. Partial Budget
D. Use of Budgets
E. Budgeting and Linear Programming
F. Price and Yield Assumptions for Budgeting and Programming

II. Risk and Uncertainty — S

A. Decision-making
B. Farmer Defense
C. Uncertainty Precautions
D. Measures Society Can Take

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	Level	Grade			
	* I/S	9	10	11	12
III. Planning Farm Insurance	S				
A. Public Liability					
B. Employees Liability					
C. Workmen's Compensation					
D. Farmer's Compensation					
E. Property - Building, Livestock, etc.					
F. Life Insurance					
Purchasing and Marketing					
I. Acquisition of Land	S				
A. Own or Rent					
B. Buying a Farm					
C. Renting Land					
D. Improvement of Farm Leases					
II. Size of Farm	S				
A. Costs and Returns as Related to Size					
B. Multiple Enterprise Farm					
III. Selection and Combination of Enterprises	S				
A. Location of Agricultural Production					
B. Principles of Comparative Advantage					
C. Factors Affecting Location					
D. Enterprise Relationship					
E. Specialization and Diversification					
F. Diversification, Risk and Uncertainty					
G. Procedures for Combining Enterprises					
IV. Influence of Change	S				
A. Changes in Technology					
B. Changes in Consumption					
C. Production-Consumption Balances					
D. Individual Farmer Adjustments					
E. Investment in the Human Agent					
F. Decision to Discontinue Farming					
G. Vertical Integration					
H. The Farmer and Economic Progress					
Financial and Legal Management					
I. Acquisition of Capital	S				
A. Role of Capital					

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Level * I/S — Grade 9 10 11 12

- B. Amount Capital to Use
- C. Basis for Credit
- D. Sources of Credit
- E. Corporation Farming
- F. Consumer Credit

II. Legal Terms and Obligations — S

- A. Contracts
- B. Deeds
- C. Option
- D. Notes
- E. Mortgages
- F. Crop Liens
- G. Bills of Sale
- H. Wills
- I. Partnerships
- J. Water and Irrigation Rights
- K. Laws
    1. Trespass
    2. Damages
    3. Livestock
    4. Dogs

Farm Organizations

I. Cooperatives — S

- A. Purchasing
- B. Marketing
- C. National Council for Farmer Cooperatives

II. General Organizations — S

- A. American Farm Bureau Federation
- B. National Grange
- C. Farmer's Union

III. Youth — S

- A. 4-H
- B. Future Farmers of America

Government Programs

I. History — S

	Level	Grade			
	* I/S	9	10	11	12
II. Department of Agriculture	S				
A. Research					
B. Soil and Water Programs					
C. Statistic Collecting					
D. Export Promoting					
E. Adjustment and Stabilizing Farm Prices					
F. Credit to Farmers					
III. Crop Insurance	S				
A. Federal Crop Insurance Corporation					
IV. Credit	S				
A. Direct to Farmers					
1. Production Credit					
2. FHA					
B. Guarantee Loans Made by Private Institutions					
1. Farm Credit Administration					
V. Labor	S				
A. Migrant Work					
1. Recruitment					
2. Laws					
VI. Surpluses	S				
A. Price Support					
B. Parity					
C. Soil Bank					
VII. Cooperative Extension	S				
A. County Agent					
B. Specialists					
C. 4-H					
D. Forestry					
E. Others					
VIII. Agricultural Conservation Service	S				
IX. Agricultural Education	S				
A. Land Grant Colleges					
B. Research					
C. Education					

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	Level * I/S	Grade 9	10	11	12
AGRICULTURAL SUPPLIES					
Agricultural Chemicals (see 01.01-02-07-00)					
I. Economic Importance in New Hampshire, Northeast and United States	I				
A. Economic Losses due to "Pest" Damage					
B. Economics of Added Production					
C. Labor and Machine Savings					
II. Occupational Opportunities (see Encyclopedia of Careers for Vocational Guidance)	I				
III. Definition of Agricultural Chemicals	S				
A. Insecticides and Acaricides					
B. Fungicides					
C. Herbicides and Growth Regulators					
D. Rodenticides and Other Pesticides					
E. Fumigants and Nematocides					
IV. Manufacturing Agricultural Chemicals	S				
A. Manufactured Types for Use as:					
1. Solid form					
a. dust					
b. granules					
c. baits					
2. Liquid form					
a. wettable powders					
b. emulsions					
c. a solution					
d. suspensions					
3. Gaseous form					
B. Packaging					
V. Recommending the Correct Chemical and Amount to Use (see 01.01-02-07-00)	S				
VI. Merchandising Agricultural Chemicals	S				
A. What is on the Pesticide Label					
1. Name of manufacturer					
2. Name of product					

*I = Introduction / S = Specialization

3. Active chemical ingredients and percentage
4. Type of chemical (herbicide, insecticide, etc.)
5. Recommendations for use
6. Directions for use
7. Personal precautions
8. Storage precautions

B. The Problem of Pesticide Names

1. Names on label
2. Acceptable common names
3. Other common (coined) names
4. Trade names
5. Chemical names
6. Guidelines for the use of pesticide names

C. Comparing Costs of Pesticides

D. Size of Containers

E. Pesticides for the Home-Owner

F. Toxicity of Pesticide

G. Trends in the Industry

VII. Need for an Agricultural Chemicals Safety Program   I

A. The Dangers to:

1. Man

2. Livestock and livestock products

3. Wildlife
    a. animal
    b. birds
    c. fish
    d. bees
    e. others

4. Plants and vegetable (plant) products

B. Laws regulating Use of Chemicals and Enforcement Procedure

1. Federal Insecticide, Fungicide and Rodenticide Act

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	Level * I/S	Grade 9 10 11 12
2. Food, Drug and Cosmetic Act		
3. State Laws		
4. Local Regulations		
C. The Safety Program		
1. Home		
2. Production agriculture (the farm)		
3. Industry		
4. First Aid (see 01.01-02-07-00)		
Livestock Feeds (see 01.01-01-02-00 and 01.01-01-06-01)		
I. Economic Importance in New Hampshire, Northeast and United States	I	
A. Effect on Production		
1. Meat		
2. Eggs		
3. Milk		
B. Economic Importance of Feed Deficiencies		
C. Economics of Feed Efficiency		
II. Occupational Opportunities (see Encyclopedia of Careers for Vocational Guidance)	I	
III. Animal Nutrition Factors	S	
A. Carbohydrates		
B. Fats		
C. Proteins		
D. Minerals		
E. Vitamins		
F. Water		
G. Air		
IV. Nutrition Needs	S	
A. Body Maintenance		
B. Production		
C. Growth		
V. Vocabulary of Common Livestock Feed Terms	S	
A. Roughages		
B. Concentrates		

	Level	Grade			
	* I/S	9	10	11	12
C. By-Products					
D. Supplements					
E. Ingredients					
F. Mash					
G. Pellets					
H. Crumbles					
I. Wafers					
J. Complete Feeds					
K. Formula Feed					
L. Additives					
M. Medicated Feeds					
N. Others					
VI. Sources of Protein for Livestock Feeds	S				
A. Animal Sources					
1. Fish meal					
2. Tankage					
3. Urea					
4. Others					
B. Plant Sources					
1. Cottonseed meal					
2. Soybean meal					
3. Others					
VII. Livestock Feed Additives	S				
A. Antibiotics					
B. Hormones					
C. Tranquilizers					
D. Others					
VIII. Factors Affecting Nutritive Value of Livestock Feeds	S				
A. Moisture					
B. Stage of Maturity					
C. Soil Fertility					
D. Climate					
E. Harvesting Methods					
F. Feed Preparation Methods					
G. Others					
IX. Factors in the Formulation of Livestock Feed Rations	S				
A. Cost					
B. Variety of Ingredients					

	Level * I/S	Grade 9 10 11 12
C. Protein Limitations		
D. Palatability		
E. Fiber Content		
F. Vitamin Content		
G. Energy Content		
H. Mineral Content		
X. Livestock Feeds Preparation	S	
A. Silage		
B. Hay		
C. Haylage, Soilage, etc.		
D. Processed Feeds		
1. Crushing, rolling, cracking, crimping		
2. Grinding		
3. Mixing		
4. Pelleting		
5. Cooking		
6. Fermenting		
7. Others		
E. Requirements for Different Types of Livestock (see 01.01-01-02-00)		
1. Dairy cattle		
2. Beef cattle		
3. Sheep		
4. Swine		
5. Poultry		
6. Horses		
7. Others		
XI. Regulations in the Formulating, Labeling, and Use of Feeds	S	
A. Federal		
B. State		
C. Department of Agriculture (State and U.S.)		
D. Food Additives Amendment		
E. Licensing		
F. Labeling		
G. Penalties		
XII. Merchandising Livestock Feeds	S	
A. Knowing the Product		
B. Fitting the Feed to a need/service		

Level * I/S | Grade 9 10 11 12

C. Methods of Handling
    1. Bags
    2. Bulk

D. Trends in the Industry

Seeds

I. Importance of Seeds — I

A. Seeds as Protectors and Propagators of their Kind

B. Seeds as Provider
    1. Man
    2. Livestock
    3. Wildlife

C. Economic Importance in New Hampshire, Northeast and United States
    1. Commercial production and use
    2. Home grown and use

II. Occupational Opportunities (see Encyclopedia of Careers for Vocational Guidance) — I

III. The History of Seeds — I

A. Early Plantings
B. Origin of Plants (seeds) and Introduction to United States
C. Important People (Gregor Mendel, etc.)
D. Quality of Seed vs. Popularity

IV. Seed Improvement — S

A. Size and Vigor
B. Seed Shape/Suitability for Planting by Machine
C. Food Quality
D. Hardness of Seed
E. Seed Dormancy
F. Hardiness and Resistances
G. Germination
H. Longevity
I. Productivity
J. Hybrids

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	Level	Grade			
	* I/S	9	10	11	12
V. The Production of Seeds	S				
A. Cereal and Grain Seeds (Corn, Wheat, Oats, Barley, etc.)					
1. Research					
2. Regional limitations/adaptability					
3. Growth requirements					
4. Cultural practices					
B. Legume and Grass Seeds (Perennials and Biennials, Summer and Winter Annuals) - (Cool Season, Warm Season)					
1. Research					
2. Regional limitation/adaptability					
3. Growth requirements					
4. Cultural practices					
C. Vegetable Seeds					
1. Research					
2. Regional limitations/adaptability					
3. Growth requirements					
4. Cultural practices					
D. Flower Seeds					
1. Research					
2. Regional limitations/adaptability					
3. Growth requirements					
4. Cultural practices					
E. Tree Seeds (Forest, Fruit, and Nut)					
1. Research					
2. Major sources a. natural stands b. tree seed orchards					
3. Cultural practices					
4. Rootstocks					
F. Other Seeds					
VI. Harvesting Seeds	S				
A. Methods					
B. Problems Associated With Harvesting the Seed					
C. Time of Harvesting					

	Level * I/S	Grade 9	10	11	12
VII. Processing Seeds	S				
A. Seed Extraction					
1. Dry Fruits					
a. Comes					
b. Nuts					
2. Fleshy Fruits					
B. Shelling					
C. Cleaning and Screening					
D. Washing					
E. Drying					
F. Curing					
G. Scarification					
H. Sizing					
I. Storing					
1. Methods					
2. Spoilage (moisture, temperature)					
3. Insects and Diseases					
J. Packaging					
1. Materials and protective characteristics					
2. Volume or weight of seed					
3. Weighing					
K. Transporting and Handling					
VIII. Control of Pests and Diseases	S				
A. Damages and Losses Resulting					
B. Identification					
C. Control					
1. Field (pre-harvest)					
2. In Storage (post-harvest)					

	Level * I/S	Grade 9	10	11	12
IX. Seed Crop Pollination	S				
A. Importance of Pollination					
B. Methods of Pollination					
C. Insecticides vs. Bees and Other Pollinating Insects					
X. Seed Treatment	S				
A. Seed Protectants					
B. During Storage					
C. At Planting Time					
XI. Testing Seeds	S				
A. Germination					
B. Weed Contamination					
C. Seedborne Organisms					
D. Moisture					
E. Purity and Origin					
XII. Certification of Seeds	S				
A. Federal Seed Act					
B. Terminology (variety, hybrid, pure lines, etc.)					
C. Labeling					
D. Naming Varieties					
E. Seed Classes					
1. Breeder seed					
2. Foundation seed					
3. Registered seed					
4. Certified seed					
F. Certification Agencies					
XIII. Merchandising Seeds	S				
A. Laws and Regulations					
B. Seed Merchandising Services and Trade Associations					
C. Package Sizes					
D. Trends					

Fertilizers

	Level	9	10	11	12
I. Economic Importance in New Hampshire Northeast and United States	I				

	Level	Grade			
	* I/S	9	10	11	12
A. Economic Value of Proper Fertilization					
1. Effect on soil					
2. Increased yields					
3. Fertilizer deficiencies					
II. Occupational Opportunities	I				
III. Organic Fertilizers	S				
A. Definition					
B. Sources					
1. Manure					
a. chemical composition					
b. characteristics					
c. storage (solids and liquids)					
d. losses					
e. utilization - methods of					
2. Green manure					
a. kinds of crops					
b. characteristics					
c. nutrient (N) fixation					
d. utilization - methods of					
3. Urea					
a. characteristics					
b. storage					
c. utilization - methods of					
4. Other organic materials					
IV. Inorganic or Commercial Fertilizers	S				
A. Definition					
B. Sources of Major Nutrients					
1. Nitrogen					
a. nitrates					
(1) sodium nitrate					
(2) calcium nitrate					
b. ammonium forms of N					
(1) anhydrous ammonia					
(2) aqua ammonia					
(3) ammonium sulfate					
(4) ammonium nitrate					
(5) ammonium phosphates					
c. synthetic organic N fertilizers					

            (1) urea
            (2) calcium cyanamide
        d. organic N materials (see III 01.02-04-00-00)

    2. Phosphorus
        a. natural phosphates
            (1) phosphate rock
            (2) bone meal
        b. processed or treated rock
            (1) single superphosphate
            (2) triple superphosphate
            (3) ammoniated superphosphates
            (4) nitric phosphates
        c. chemical phosphate fertilizers
            (1) liquid phosphoric acid
        d. by-product phosphorus fertilizers
            (1) basic or Thomas slag

    3. Potassium
        a. muriate of potash or potassium chloride
        b. sulfate of potash
        c. sulfate of potash - magnesium
        d. potassium nitrate

    4. Magnesium
        a. dolomite
        b. magnesium sulfate

    5. Sulfur
        a. gypsum
        b. soil sulfur

    6. Trace elements

  C. Manufacturing
  D. Storage
  E. Losses
  F. Utilization - methods of

IV. Fertilizer Grades and Formulation S

  A. Straight
  B. Complete
  C. Mixed
  D. Ratios (Grade)

V. Analysis S

  A. Regulations and Laws

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	Level * I/S	Grade 9	10	11	12
B. Labeling					
C. Inspection and Testing					
D. Penalties					
VI. Determining Fertilizer Amounts	S				
A. Soil Testing					
B. Crop Requirements					
VII. Lime - Fertilizer Relationship	S				
A. Fineness of Material and Liming Efficiency					
B. Common Liming Material					
1. Ground Agricultural Limestone					
2. Ground Dolomitic Limestone					
3. Other Material					
a. hydrated lime					
b. oyster shells					
c. marl					
d. basic slag					
e. wood ashes					
VIII. Selection, Calibration, and Maintenance of Fertilizer and Liming Equipment (see 01.03-00-00-00)	S				
IX. Merchandising Fertilizer and Future Trends of the Industry	S				
A. Consumer Demands and Consumer Interests					
B. Advertising/Effects					
C. Using Experiment Station Reports					
D. Trends in the Industry					

Other Agricultural Supplies (specify)

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	Level * I/S	Grade 9	 10	 11	 12
AGRICULTURAL MECHANICS					
I. Economic Importance in New Hampshire, Northeast and United States	I				
II. Occupational Opportunities (see Encyclopedia of Careers for Vocational Guidance)	I				
Agricultural Power and Machinery					
I. Power					
A. Sources	I				
1. Wind a. windmill b. sail c. air stream					
2. Water a. water wheel b. turbine c. generator					
3. Steam a. engine b. turbine					
4. Electricity a. light b. heat c. motors					
5. Gas a. light b. heat c. turbine					
6. Gasoline a. light b. heat c. engine d. jet					
7. Diesel a. light					

*I = Introduction / S = Specialization

Level * I/S — Grade 9 10 11 12

    b. heat
    c. engine
    d. jet

  8. Atomic
    a. heat
    b. pressurized water system
    c. steam turbine
    d. light

  9. Jet
    a. gas fuel
    b. liquid fuel
    c. solid fuel

B. External Combustion (engine power) — I

  1. Steam
    a. piston type
    b. turbine type

  2. Atomic
    a. boiling water steam turbine
    b. heated gas turbine

C. Internal Combustion (engine power) — I

  1. Fuel systems
    a. gas injection
    b. gasoline vaporized
    c. diesel pressurized injection
    d. liquid - propellant (rocket) (liquid plus oxygen)

  2. Ignition systems
    a. spark ignition (S. I.)
    b. compression ignition (C. I.)

  3. Power systems cycle (S. I. and C. I.)
    a. four-stroke cycle (720°) (intake, compression, power, exhaust)
    b. two-stroke cycle (360°) (intake, compression, power, exhaust)

  4. Lubrication systems
    a. gravity
    b. pump
    c. pressure

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Level * I/S — Grade 9 10 11 12

5. Power transmissions systems
    a. shaft
    b. gear
    c. hydraulic
    d. electric
    e. pneumatic

6. Cooling systems
    a. air
    b. liquid
    c. pressurized

7. Traction
    a. tire size
    b. tire ply
    c. tire tread
    d. tire pressure
    e. chains
    f. rubber track
    g. steel track

II. Tillage Machinery — S

A. Plows

1. Types
    a. moldboard
    b. disc
    c. vibrators

2. Adjustment
    a. colter
    b. plow bottom (vertical)
    c. landside width (horizontal)
    d. hitch
    e. hydraulic control
    f. draft

3. Operation
    a. field lay-out
    b. slippage
    c. depth of furrow
    d. operating speed
    e. refuse coverage
    f. scouring

4. Maintenance
    a. lubricate
    b. hardsurface
    c. daily maintenance

Level | Grade
* I/S | 9 10 11 12

d. rust-proof
e. repair or replace broken or worn parts

B. Harrows (Disc)

1. Types
a. plain disc
b. cutaway disc
c. crimped disc
d. heavy duty

2. Adjustment
a. angle
b. penetration depth
c. weight per square inch surface
d. hydraulic control

3. Operation
a. speed of travel
b. diameter of disc
c. line of draft
d. penetration
e. transport wheels

4. Maintenance
a. lubricate
b. sealed bearings
c. daily maintenance
d. rust-proof
e. replace or repair broken or worn parts

III. Cultural Machinery S

A. Seeders

1. Type
a. broadcast
b. drill
c. band

2. Adjustment
a. depth of planting
b. rate of planting
c. fertilizer application and location
d. hydraulic control

3. Operation
a. speed of travel
b. rate of application ie. variety used
c. line of draft

Level * I/S	Grade 9 10 11 12

4. Maintenance
    a. lubricate
    b. replace or repair broken or worn parts
    c. clean after use
    d. store (protect from elements)

B. Manure Spreader

1. Types
    a. traction driven
    b. P.T.O. driven
    c. side delivery
    d. rear end delivery
    e. front end delivery
    f. liquid

2. Adjustment
    a. rate of application
    b. uniformity of application
    c. shreading action

3. Operation
    a. travel speed
    b. loading procedure
    c. angle of turn with P.T.O. engaged
    d. avoid loading stone, etc.
    e. P.T.O. operation

4. Maintenance
    a. clean and paint periodically
    b. avoid freezing
    c. replace or repair broken or worn parts
    d. lubricate

C. Fertilizer Spreaders

1. Types
    a. broadcast
    b. drill
    c. P.T.O. operated
    d. traction driven

2. Adjustment
    a. uniformity of application
    b. application rate for fertilizer used
    c. accuracy of setting
    d. checking accuracy

3. Operation
    a. travel speed
    b. avoid loading stone, etc.
    c. clean after each days use
    d. observe application

4. Maintenance
    a. clean and paint annually
    b. replace or repair broken or worn parts
    c. store or protect from elements

D. Sprayers (Low Pressure Under 150PSI)

1. Types (weed, pesticide, liquid fertilizer, whitewash)
    a. low pressure high rate of application
    b. low pressure low rate of application
    c. fan
    d. cone

2. Types of pumps
    a. diaphragm
    b. roller impeller
    c. piston

3. Adjustment
    a. accuracy of application
    b. uniform pressure

4. Operation
    a. spray pattern
    b. volume from each nozzle
    c. strain all material used
    d. spray pattern width for row crops
    e. uniform P.T.O. speed
    f. agitation

5. Maintenance
    a. flush at end of each days use
    b. check accuracy of pressure gage annually
    c. note nozzle jet wear (abrasives wear jet)
    d. winter storage

E. Cultivators

	Level * I/S	Grade 9 10 11 12
1. Types a. mounted b. trailer		
2. Adjustment a. tilt of shovels, teeth or sweeps b. depth c. row spacing d. check trips		
3. Operation a. travel speed b. hydraulic lift c. teeth uniform depth d. weather conditions e. soil condition		
4. Maintenance a. hardening teeth b. replace or repair broken or worn parts c. rust proof		
IV. Harvesting Machinery	S	
A. Mowers		
1. Types a. sickle bar b. rotary c. flail		
2. Adjustment a. sections on ledger plates b. level cut c. spring tension d. hydraulic lift e. safety hitch f. cutterbar lead		
3. Operation a. proper P.T.O. speed b. height of cut control c. H.P. requirement		
4. Maintenance a. sharpen all types b. sharpen sickle bar type daily c. replace or repair broken or worn parts		

Level	Grade
* I/S	9 10 11 12

d. rust proof
e. lubricate
f. protect from elements

B. Hay Conditioners

1. Types
   a. corregated rolls (crimper)
   b. rubber rolls

2. Adjustment
   a. operational height from ground
   b. tension on rolls
   c. slip clutch
   d. safety shields

3. Operation
   a. angle of turn with P.T.O. engaged
   b. recommended speed of rolls (P.T.O.)
   c. spring or hydraulic roll tension

4. Maintenance
   a. check safety slip clutch annually
   b. lubricate
   c. replace or repair broken or worn parts
   d. protect from elements

C. Side-Delivery Rake

1. Types
   a. reel
   b. pin wheel

2. Adjustment
   a. teeth to ground relationship
   b. line of draft to avoid wheel on windrow
   c. angle of teeth

3. Operation
   a. reel level
   b. speed of travel
   c. direction of travel
   d. contact with ground

4. Maintenance
   a. replace or repair broken or worn parts
   b. lubricate
   c. protect from elements

	Level	Grade
	* I/S	9 10 11 12

D. Balers

1. Types
   a. P.T.O. operated
   b. auxiliary engine

2. Adjustment
   a. size bale
   b. density of bale
   c. height of pick-up
   d. twine tension
   e. knotter adjustment

3. Operation
   a. recommended operational speed
   b. angle of turn with P.T.O. engaged
   c. knotter assembly clean

4. Maintenance
   a. check safety slip clutch annually
   b. knife sharpening
   c. clearance between knife and shear plate
   d. replace or repair broken or worn parts
   e. protect from elements
   f. lubricate

E. Forage Harvester

1. Types
   a. tractor drawn
   b. tractor mounted
   c. self-propelled

2. Adjustment
   a. height of pick-up from ground
   b. knife to shear plate relationship
   c. recommended speed of machine when operating
   d. length of cut

3. Operation
   a. recommended operational speed
   b. angle of turn with P.T.O. engaged
   c. knives sharp
   d. direction of travel

4. Maintenance
   a. check safety devices in power train annually
   b. lubricate

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Level
* I/S

Grade
9 10 11 12

   c. replace or repair broken or worn parts
   d. protect from elements

Agricultural Structures and Conveniences

I. Service Center Planning (Private and Commercial) I

  A. Purpose

    1. Repair and maintenance of own equipment

    2. Construction or modification of equipment

  B. Size of Building

    1. Storage space (parts, supplies, hardware)

    2. Floor space required

    3. Daily use

  C. Location

    1. Convenience (accessability)

    2. Fire hazard

    3. Drainage

    4. Provision for future expansion

    5. Appearance

    6. Availability of utilities (electricity, water, sewage, telephone)

    7. Heating and ventilating

    8. Office (maintenance records, operators manuals

    9. Protection from weather

    10. Multiple utilization

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	Level * I/S	9	10	11	12
II. Hand Tools	I				
A. Identification					
B. Inventory					
C. Safe Use					
D. Purchasing					
III. Power Tools	I				
A. Identification					
B. Inventory					
C. Safe Use					
D. Purchasing					

Soil and Water Management (see 01.03-04-01-00, 01.03-04-13-00, and 01.03-04-15-00)

Agricultural Mechanics Basic Skills

	Level * I/S	9	10	11	12
I. Sketches, Plans and Drawings	I				

A. Selecting Drawing Equipment

1. Drawing board
2. Architects scale
3. Engineers scale
4. T-square
5. Triangles
6. Protractor
7. Drawing instruments

B. Using Lines

1. Border
2. Object
3. Hidden
4. Dimension
5. Extension
6. Break

C. Making Sketches

1. Pictorial
2. Isometric
3. Oblique
4. Perspective

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	Level	Grade
	* I/S	9 10 11 12
D. Planning a Layout		
1. Horizontal 2. Vertical 3. Inclined		
E. Selecting and Using Lettering		
1. Vertical 2. Capital letters 3. Lower case letters		
F. Drawing to Scale		
1. Lines proportional to object lines 2. Scale indicated		
G. Reproducing Drawings		
1. Blue print 2. Off-set		
H. Making Bill of Material		
1. Amount, size and kind 2. Portrayed by drawing 3. Exact, complete 4. Making cost computation		
II. Tool Fitting	I	
A. Clean		
1. Lump pumice stone 2. Wire buffer		
B. Repair		
1. Handles		
C. Shape		
1. Restore to original angle ie. shape		
D. Sharpen		
1. Files (file card and scorer) 2. Grinding stone grit (80) safe speed 3. Set		

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	Level * I/S	Grade 9	10	11	12
E. Rust-Proof					
1. Rust-proof compound					
2. Mineral oil					
3. Animal fat					
III. Cold Metal Work	I				
A. Identification and Classification					
1. American iron and steel institute (AISI)					
2. Number code and color markings					
3. Spark test					
4. Magnetic					
B. Marking					
1. Prick punch					
2. Center punch					
3. Scriber					
4. Soapstone pencil					
C. Cutting					
1. Cold chisel					
2. Cold cutter					
3. Hand and power hack saw					
4. Gas torch					
5. Shear					
D. Shaping					
1. Bending jigs					
2. Hand or power bending machine					
E. Drilling					
1. Types of drills					
2. Speeds of drills					
F. Tapping					
1. Kinds of threads					
2. Size of tap hole					
3. Lubricants					
4. Female fittings					

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	Level * I/S	Grade 9	10	11	12
G. Threading					
1. Kinds of threads					
2. Lubricants					
3. Power					
4. Male fittings					
IV. Hot Metal Work	I				
A. Identification and Classification					
1. American Iron and Steel Institute (AISI)					
2. Number code and color markings					
3. Spark test					
4. Wrought iron					
B. Marking					
1. Center punch					
2. Steel measure					
C. Holding					
1. Straight lip tongs					
2. Bolt tongs					
3. Pliers					
D. Cutting					
1. Hot cutter					
2. Hardie					
3. Gas torch					
4. Arc welder and cutting electrodes					
5. Arcair torch and cutting electrodes					
E. Shaping					
1. Anvil and hammer					
2. Hydraulic press					
3. Trip hammer					
4. Upsetting					
5. Drawing					

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01.03-04-05-00

	Level	Grade			
	* I/S	9	10	11	12
F. Punching Holes					
1. Hand punch					
2. Power punch					
G. Heat Treating Steel					
1. Hardening					
2. Tempering					
3. Annealing					
4. Case Hardening					
V. Arc Welding					
A. Selecting Machines	I				
1. Alternating current					
2. Direct current					
3. Limited input					
B. Selecting Accessories	I				
1. Electrode holder					
2. Ground clamp					
3. Chipping hammer and wire brush					
4. Screen					
5. Metal table					
6. Waste can					
C. Selecting protective Equipment	I				
1. Head shield					
2. Cover glass and lens holder					
3. Filter lens					
4. Cover glass					
5. Gloves, apron and jacket					
6. Exhaust					
D. Determining Type of Ferrous Metal to be Welded	I				
1. Spark test					
2. Paint color found on stock					
3. Clean ie. bevel					
E. Determining Amperage Setting	I				
1. Trial setting					
2. Uniform bead width, height and slightly oval (correct)					

	Level	Grade			
	* I/S	9	10	11	12
3. Excessive spatter and penetration (too hot)					
4. Penetration lacking (too cold)					
F. Selecting Electrodes	I				
1. Electrode number, size and characteristics					
2. Parent metal composition					
3. Application					
G. Determining Electrode Movement and Speed of Travel	I				
1. Manufacturers recommendation					
2. Scratch method					
3. Observe molten pool					
4. Examine welded bead and compare to ideal					
5. Gravitational pull					
6. Practice					
H. Selecting Type of Joint	I				
1. Square butt					
2. Single Vee					
3. Double Vee					
4. Tee					
5. Lap					
I. Determining Welding Position	I				
1. Flat					
2. Horizontal					
3. Vertical					
4. Overhead					
J. Welding Cast Iron	S				
1. Parent metal preparation					
2. Machinable nickel bearing electrode					
3. Non-machinable steel core electrode					
4. Pre-weld treatment					
5. Post-weld treatment					
K. Cutting, Piercing, and Beveling	S				
1. Special cutting electrodes					
2. Amperage setting					
3. Guide materials					

01.03-04-05-00
01.03-04-06-00

	Level	Grade			
	* I/S	9	10	11	12
L. Hard Surfacing	S				
1. Abrasion wear					
2. Impact wear					
3. Parent metal preparation					
4. Electrode manufacturers recommendation					
5. Trial sample					
M. Using Carbon Arc Torch	S				
1. Ultraviolet and infrared rays					
2. Copper coated carbons					
3. Economical heat source					
4. Flux requirement for brazing					
5. Weld					
6. Braze					
7. Solder					
VI. Heliarc or Tungsten Inert Gas Welding					
A. Selecting Equipment and Controls	S				
1. Alternating current (A.C.)					
2. Direct current (D.C.)					
3. Direct current straight polarity (DCSP)					
4. Alternating current reverse polarity (ACRP)					
5. Inert gas and controls (argon)					
6. Frequency control					
7. Density control					
8. Water cooled					
B. Selecting Torch and Accessories	S				
1. Foot control					
2. Tungsten electrodes					
3. Ceramic cups					
4. Collet body					
5. Metal welding bench					

01.03-04-06-00
01.03-04-07-00

	Level * I/S	9	10	11	12
C. Selecting Safety Equipment	S				
1. Screen					
2. Helmet (number 12 lens)					
3. Gloves					
4. Jacket					
5. Hot metal tongs or pliers					
6. Exhaust					
D. Application	S				
1. Metals to consider					
2. Selecting filler rods					
3. Speed					
4. Cleanliness					
5. Manual or semiautomatic					
E. Operation	S				
1. Interpreting manufacturer's chart setting guide					
2. Shielded atmosphere					
3. Welding direction					
4. Cost					
VII. Metalic Inert Gas Welding (MIG)					
A. Selecting Equipment	S				
1. Portability					
2. Electrical requirement					
3. Gas requirement and controls					
4. Controls					
5. Welding bench					
B. Selecting Safety Equipment	S				
1. Screen					
2. Helmet					
3. Lens density					
4. Gloves					
5. Jacket					
6. Exhaust					

01.03-04-07-00
01.03-04-08-00

	Level	Grade			
	* I/S	9	10	11	12
C. Application	S				
1. Speed of travel					
2. Cleanliness					
3. Manual or automatic					
4. Metals to consider					
5. Efficiency					
6. Cost					
7. Wire selection					
D. Operation	S				
1. Interpreting manufacturer's setting guide					
2. Controlled atmosphere					
3. Select appropriate filler wire					
4. Calculating cost					
5. Setting for all-position					
VIII. Oxy-Acetylene Welding					
A. Selecting Equipment	I				
1. Oxygen two stage regulator and hose					
2. Acetylene two stage regulator and hose					
3. Welding torch and tips					
4. Cutting torch and tips					
5. Regulator wrench					
B. Selecting Safety Equipment	I				
1. Igniter					
2. Goggles (number 5 lens)					
3. Clear cover lenses					
4. Jacket					
5. Exhaust					
C. Selecting Accessories	I				
1. Filler rods					
2. Brazing rods					

	Level	Grade			
	* I/S	9	10	11	12
3. Special rods					
4. Special fluxes					
5. Soapstone markers					
6. Metal welding bench					
7. Flints for igniter					
8. "T" wrench for acetylene cylinder					
9. Tip cleaners					
D. Equipment Assembly	I				
1. Secure cylinders					
2. Oxygen (green hose)					
3. Acetylene (red or black)					
4. Testing for leaks					
E. Operation	I				
1. Lighting torch					
2. Adjusting flame					
3. Safe use of torch					
4. Turning off torch flame					
5. Cleaning torch tip					
6. Heating iron to critical temperature					
7. Heating iron to brazing temperature					
8. Heating iron to welding temperature					
9. Weld with filler rod					
10. Cost of heat source					
F. Welding Positions	I				
1. Flat weld					
2. Horizontal weld					
3. Vertical weld					
4. Overhead weld					
G. Cast Iron Welding	S				
1. Parent metal preparation					
2. Bronze filler rod					
3. Cast iron rod					
4. Flux and flux coating					
5. Temperature control					
H. Cutting	I				
1. Assemble cutting torch					
2. Lighting cutting torch					
3. Gas pressures					
4. Disposition of burning iron					
5. Turning off torch					
6. Cost per foot					

01.03-04-08-00
01.03-04-09-00

	Level * I/S	Grade 9	10	11	12
I. Hard Surfacing	S				
1. Abrasion wear					
2. Impact wear					
3. Parent metal preparation					
4. Selecting rods					
5. Cast hardening powders					
6. Trial sample					
IX. Soldering and Sheet Metal Work					
A. Identifying Types of Sheet Metal	I				
1. Color					
2. Magnetic					
3. Hardness					
B. Marking	I				
1. Scriber					
2. Colored pencil					
C. Selecting Solder	I				
1. Types					
2. Composition					
3. Flux cored					
D. Selecting Fluxes	I				
1. Anti-oxidizers					
2. Cleaners					
3. Alloying compounds					
4. Tinning compounds					
E. Selecting Equipment	I				
1. Heat sources					
2. Soldering coppers					
3. Tinning					
4. Tin snips					
5. Seamers					
6. Metal gauge					
7. Wood mallet					
8. Break					
9. Riveting hammer					
10. Turning tool					
11. Rivet set					

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01.03-04-10-00

	Level	Grade			
	* I/S	9	10	11	12
F. Selecting Other Sheet Metal Fasteners	I				
1. Sheet metal screws					
2. Rivets and burrs					
3. Bolts					
X. Wood Construction					
A. Selecting Lumber	I				
1. Hardwood					
2. Softwood					
3. Exterior use					
4. Interior use					
B. Selecting Grades	I				
1. Select					
2. Seconds					
3. Common					
4. Finish					
5. 4S					
C. Selecting Measures	I				
1. Types					
2. Uses					
3. Accuracy					
4. Scales					
5. Tables					
D. Determining How to Lay Out	I				
1. Rafters					
2. Ridge board					
3. Stair stringers					
4. Square cuts					
5. Angular cuts					
6. Joints					
E. Selecting and Using Power Saws	I				
1. Bench					
2. Radial arm					
3. Portable electric					
4. Band					
5. Sabre					
6. Jig					

	Level	Grade			
	* I/S	9	10	11	12
F. Selecting and Using Power Surfacing Tools	I				
1. Jointer					
2. Thickness planer					
3. Belt sanders					
4. Circular sanders					
5. Vibrating					
XI. Glazing					
A. Selecting and Using Tools	I				
1. Glass cutters					
2. Putty knives					
3. Calking guns					
B. Selecting Accessories	I				
1. Glazier points					
2. Glazier clips					
3. Glazing compound					
C. Setting Glass in Wood Sash	I				
D. Setting Glass in Steel Sash	I				
E. Setting Glass in Aluminum Sash	I				
XII. Painting					
A. Selecting and Using Outside Paints	I				
1. Lead					
2. Zinc oxide					
3. Titanium dioxide					
4. Iron oxide					
5. Latex					
6. Preservatives					
B. Selecting and Using Interior Paints	I				
1. Rubber base					
2. Enamels - gloss - semigloss					
3. Latex					
4. Varnish					
5. Stains					
C. Selecting and Using Metal Paints	I				
1. Red lead					

01.03-04-12-00
01.03-04-13-00

	Level	Grade			
	* I/S	9	10	11	12
2. Metalic zinc					
3. Aluminum					
4. Rust inhibitors					
D. Selecting Supplies	I				
1. Vehicles					
2. Thinners					
3. Driers					
4. Brushes					
5. Paint and varnish removers					
E. Selecting and Using Spray Painting Equipment	I				
1. Pressure type					
2. Siphon type					
3. Slinger type					
4. Bleeder type					
XIII. Masonry Construction					
A. Selecting materials	S				
1. Cement					
2. Aggregates					
3. Water					
4. Reinforcing					
5. Air entrained					
6. Blocks					
7. Forms					
8. Insulation					
B. Selecting Concrete Mixtures	S				
1. By volume					
2. By weight					
3. Use of concrete					
4. Calculating amount of materials needed					
5. Mortar					
C. Determining Source	S				
1. Mix on location					
2. Ready mix					
D. Selecting and Using Special Tools	S				
1. Hand floats					
2. Power floats					

01.03-04-13-00
01.03-04-14-00

	Level	Grade			
	* I/S	9	10	11	12
3. Trowels					
4. Vibrators					
5. Level					
6. Mortar board					
7. Chalk line					
8. Hod					
XIV. Electricity					
A. Selecting Conductors	I				
1. Silver					
2. Copper					
3. Gold					
4. Aluminum					
5. Bronze					
B. Determining and Making a Circuit	I				
1. Conductors					
2. Electrons					
3. Distribution panel					
C. Determining Electron Travel, Through Resistance to and From Distribution Panel	I				
1. Amperage					
2. Voltage					
3. Watts					
4. Kilowatts					
5. Direct current					
6. Alternating current					
D. Constructing Simple A.C. Circuit	I				
1. Ground					
2. Live					
3. Polarization					
4. Friction (heat)					
5. Neon test light					
E. Planning a Wiring System	I				
1. Lights					
2. Power					
3. Heat					
4. Safety devices					

	Level	Grade			
	* I/S	9	10	11	12
F. Selecting and Using Controls	S				
1. Tumbler switch					
2. Thermal overload protector					
3. Limit switch					
4. Automatic pressure type switch					
5. Line voltage thermostat					
6. Humidity control switch					
7. Photoelectric control					
8. Percentage type repeat cycle timer control					
9. Time clock switch					
10. Interval type time switch					
11. Repeat cycle time switch and thermostat					
12. Single throw relay and push button station					
13. Magnetic starter switch and start-stop push button					
14. Time delay relays					
15. Three pole double throw toggle switch (to reverse split-phase motor)					
16. Bin switches for automatic control of conveyors					
G. Selecting Motors	I				
1. Split-phase					
2. Capacitor					
3. Repulsion induction					
4. Universal					
5. Single phase					
6. Three phase					
7. Add a phase					
XV. Plumbing					

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01.03-05-00-00
01.03-06-00-00
01.03-99-00-00

	Level * I/S	Grade 9	10	11	12
A. Selecting a Domestic Water Supply System	S				
1. Spring					
2. Shallow well					
3. Deep well (drilled, driven)					
4. Volume					
5. Pressure					
6. Gravity					
7. Water treatment					
B. Selecting and Installing a Water Pump	S				
1. Double action piston force pump					
2. Centrifugal					
3. Turbine					
4. Jet					
5. Helical					
C. Selecting and Using Water Pipe and Fittings	S				
1. Iron					
2. Brass					
3. Copper					
4. Plastic					
D. Selecting a Waste Disposal System	S				
1. Septic tanks					
2. Cesspools					
3. Dry wells					
4. Drainage field					
5. Local regulations ie. codes					
6. Community planning aspects					
E. Selecting Waste Water Pipe	S				
1. Iron					
2. Copper					
3. Cast iron					
4. Plastic					
5. Clay tile					

Agricultural Construction and Maintenance (see 01.03-04-00-00)

Agricultural Electrification (see 01.03-04-13-00)

Other Agricultural Mechanics (specify)

01.04-00-00-00
01.04-01-00-00
01.04-01-01-00
01.04-01-01-01

	Level	Grade			
	* I/S	9	10	11	12
AGRICULTURAL PRODUCTS					
I. Economic Importance in New Hampshire, Northeast and United States	I				
II. Occupational Opportunities (see Encyclopedia of Careers for Vocational Guidance)	I				
Food Products and Processing					
Meat, Fish, Poultry, and Eggs					
I. Meat	S				
A. Trends					
1. Research					
2. Geographical specialization					
3. Consumer demands					
4. Breeding for quality					
5. Consumption rates					
6. History					
B. Differentiating Terms					
1. Veal					
2. Beef					
3. Lamb					
4. Mutton					
5. Pork					
C. Nutritional Value					
1. Water content					
2. Proteins					
3. Fats					
4. Carbohydrates					
5. Vitamins					
6. Calories					
7. Inorganic components (minerals)					
D. Factors Influencing Quality of Fresh Meat					
1. Pre-slaughter					
a. hereditary factors					

*I = Introduction / S = Specialization

   b. physiological factors
   c. feeding and management
   d. slaughtering

2. Post-slaughter
   a. first 24 hours
   b. rigor mortis
   c. aging
   d. retail handling
   e. consumer handling

E. Factors Influencing Quality of Cured Meat

1. Surface discoloration
   a. browning
   b. undercure
   c. overcure
   d. light fading
   e. rancid fats
   f. chemical
   g. bacterial greening

2. Interior discoloration
   a. overcure
   b. undercure
   c. green rings and cores

3. Interior spoilage
   a. sour flavor
   b. odor
   c. gassiness

4. Slime and mold

F. Palatability Characteristics

1. Color
2. Odor
3. Flavor
4. Juiciness
5. Tenderness
6. Texture

G. Grades

1. Cuts of meat (beef, veal, pork, lamb)
   a. wholesale
   b. retail

2. Federal Grade standards
   a. prime
   b. choice
   c. good
   d. commercial
   e. utility, cull
   f. cutter
   g. canner

H. Processing

1. Slaughtering
   a. home
   b. commercial

2. Ripening/aging

3. Preservation
   a. methods
      (1) refrigeration
      (2) freezing
      (3) thermal
         (a) pre-cooked
         (b) canned
      (4) dehydration
      (5) radiation
      (6) chemicals and antibiotics
      (7) smoking
      (8) organic acids
      (9) carbon dioxide
      (10) ozone

   b. structural changes of animal tissue
      (1) cooking effect
      (2) cold storage effect
      (3) freezing effect
      (4) tenderizing treatment effect

   c. microbiological factors
      (1) bacteria
      (2) yeast and molds
      (3) food poisoning
      (4) parasites

4. Storage
   a. fresh
   b. frozen
   c. canned
   d. other

Level	Grade
* I/S	9 10 11 12

5. Packaging
   a. fresh meats
   b. cured meats
   c. packaging materials

6. Retail selling

I. Edible Meat By-Products

1. Sausage
2. Hog-head cheese
3. Hot-dogs/frankfurters
4. Spreads

J. Non-Edible Meat By-Products

1. Tankage
2. Fertilizers
3. Pet food (dogs, cats, etc.)
4. Others

K. Meat Inspection and Regulations

1. Inspection process
   a. purpose
   b. history of
   c. application for

2. Inspection agencies
   a. local
   b. state and interstate
   c. federal
   d. import and export

3. Regulations and laws
   a. specification requirements and inspection
      (1) slaughtering methods
      (2) slaughtering facilities and equipment
      (3) processing facilities and equipment
      (4) transportation and storage facilities
      (5) personnel
      (6) inspection facilities

	Level	Grade
	* I/S	9 10 11 12
b. standards of identity for meat products		
(1) inspection marks/stamps		
(a) carcasses		
(b) cuts of meats		
(c) processed meats and meat-food products		
(2) labeling		
(3) methods of enforcement		
(4) penalties		
c. adulteration		
d. misrepresentation		
II. Fish	S	
A. Trends		
1. Research		
2. Consumer demands		
3. Consumption rates		
4. Future		
5. History		
B. Differentiating Terms		
1. Haddock		
2. Cod		
3. Mackerel		
4. Flounder		
5. Herring		
6. Salmon		
7. Shellfish		
8. Oceanography		
9. Bureau of Commercial Fisheries		
C. Classes of Fish		
1. Vertebrate or Fin		
2. Shell Fish		
a. crustaceans		
b. mollusks		
D. Nutritional Value		
1. Water content		
2. Proteins		
3. Fats		
4. Carbohydrates		

Level	Grade
* I/S	9 10 11 12

5. Vitamins
6. Calories
7. Inorganic components (minerals)

E. Qualities

1. Freshness
    a. vertebrates
        (1) gills
        (2) eyes
        (3) flesh
        (4) odor

    b. shellfish
        (1) alive
        (2) body
        (3) shells
        (4) odor

F. Grades and Cuts

1. Department of the Interior

2. Regulations

3. U. S. Grade "A"

4. Cuts
    a. whole
    b. drawn
    c. pan-dressed
    d. steaks
    e. fillets
    f. sticks
    g. canned

G. Processing

1. Fresh

2. Canning

3. Curing
    a. drying
    b. smoking
    c. salting
    d. pickling

4. Filleted

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01.04-01-01-03

Level   Grade
* I/S   9 10 11 12

- 5. Freezing
  - a. quick
  - b. glazing
  - c. packaging

H. Edible Fish By-Products

- 1. spreads
- 2. Other

I. Non-Edible Fish By-Products

- 1. Glue
- 2. Feed stuffs (livestock, poultry, pets)
- 3. Fertilizer
- 4. Paints and varnish
- 5. Others

J. Storage

- 1. Fresh
- 2. Canned
- 3. Frozen
- 4. Other

K. Inspection and Regulation (see item "K" under meat)

- 1. History of inspection (fish)
- 2. Department of the Interior
- 3. Bureau of Commercial Fisheries
- 4. Voluntary inspection
- 5. Continuous inspection
  - a. line
  - b. sampling
  - c. unofficial

III. Poultry   S

A. Trends

- 1. Research
- 2. Specialization
  - a. producers
  - b. processing
- 3. Consumer demands

Level	Grade			
* I/S	9	10	11	12

4. Breeding for quality

5. Consumption
   a. broilers
   b. fowl
   c. turkeys

6. Integration
   a. marketing and central contracts
   b. production contracts
   c. owner - integration

7. History

B. Sources of Production

1. Specialized plants
2. By-products of eggs
3. General purpose farms

C. Classification and Identification of Dressed Poultry

1. Young birds
   a. broilers
   b. fryers
   c. roasters
   d. pullets
   e. stags
   f. capons
   g. slips

2. Old birds
   a. fowl
   b. stewing
   c. cocks

D. Nutritional Value

1. Water content
2. Protein
3. Fat
4. Carbohydrates
5. Vitamins
6. Calories
7. Inorganic compounds (minerals)

E. Grades

1. U. S. Grade No. 1
2. U. S. Grade No. 2
3. Rejects

	Level	Grade			
	* I/S	9	10	11	12

F. Quality Control

1. Breed
2. Adaptability to market use
3. Conformation
4. Uniformity
5. Age and sexual maturity
6. Vigor
7. Color
8. Laws and regulations
    a. federal
    b. interstate
    c. state and local

G. Slaughtering

1. Dressing plants
    a. private
    b. co-operative
    c. integrated
    d. commercial

2. Laws and regulations
    a. federal
    b. interstate
    c. state and local

3. Methods
    a. killing
    b. picking
    c. cooling
    d. drawing
    c. cut-up

H. Packaging

1. Types
    a. commercial
    b. retail

2. Methods

3. Materials

I. Preservation

1. Freezing
2. Canning
3. Smoking

Level Grade
* I/S 9 10 11 12

J. Methods of Selling

1. Hucksters
2. Country stores
3. Integration
4. Brokers
5. Receiver - Wholesaler
6. Jobber
7. Retailer
8. Co-operative

IV. Eggs S

A. Trends

1. Research

2. Specialization
    a. producers
    b. processing

3. Consumer demands

4. Breeding for quality

5. Consumption
    a. fresh
    b. dried
    c. frozen

6. Integration
    a. marketing and control contracts
    b. production contracts
    c. owner - integration

7. History

B. Differentiating Terms (Parts of the Egg)

1. Shell
2. Membranes
3. Albumen
4. Yolk
5. Air cell
6. Chalazo

Level	Grade
* I/S	9 10 11 12

C. Nutritional Value

  1. Water content
  2. Protein
  3. Fats
  4. Inorganic and organic compounds
  5. Vitamins
  6. Calories

D. Quality Control

  1. Physical conditions
     a. feeds and nutrition
     b. diseases
     c. ovarian conditions
     d. oviduct

  2. Interior
     a. condition of yolk
     b. condition of albumen
     c. size and condition of air cell
     d. temperature
     e. humidity
     f. hydrogen concentration

  3. Exterior
     a. soundness of shell
     b. cleanliness
     c. size
     d. color
     e. shape

E. Grading

  1. Candling

  2. Personal judgement

  3. National grade rule

  4. United States standard

  5. Consumer grades specification
     a. U. S. Consumer grade AA
     b. U. S. Consumer grade A
     c. U. S. Consumer grade B
     d. U. S. Consumer grade C
     e. No grade

Level	Grade
* I/S	9 10 11 12

6. Weight classes
   a. jumbo (28 oz.)
   b. extra large (26 oz.)
   c. large (24 oz.)
   d. medium (21 oz.)
   e. small (18 oz.)

F. Packaging

1. Materials

2. Foreign market

3. Retail market

4. Wholesale market

5. Labeling
   a. purpose
   b. misbranding
   c. legal requirements
   d. designs

G. Preservation

1. Farm storage

2. Refrigeration
   a. holding
   b. transportation

3. Storage warehouse
   a. temperature
   b. humidity

4. Freezing

5. Dehydration

H. Method of Selling

1. Hucksters
2. Country stores
3. Integration
4. Brokers
5. Receivers - Wholesalers
6. Jobbers
7. Retailer
8. Co-operative
9. Chicago Merchantile Exchange

01.04-01-02-00
01.04-01-02-01

	Level * I/S	Grade 9 10 11 12
I. Market Milk and Cream	S	

Dairy Products

I. Market Milk and Cream S

- A. Trends
  - 1. Research
  - 2. Geographic Regions of Specialization
  - 3. Consumer demands
  - 4. History
  - 5. Consumption rate
- B. Milk Classification
  - 1. Certified
  - 2. Grade A
  - 3. Grade B
  - 4. Surplus
- C. Special Brands of Milk
  - 1. High test milks
  - 2. Low curd tension
  - 3. High vitamin A content
  - 4. High vitamin C content
- D. Composition of Milk and Nutritional Value
  - 1. Milk fat
    - a. fatty acids
  - 2. Phospholipids
  - 3. Cholesterol
  - 4. Carotinoids
  - 5. Vitamin A, C
  - 6. Proteins
  - 7. Lactose
  - 8. Minerals
  - 9. Water
  - 10. Others

Level * I/S	Grade 9 10 11 12

E. Physical and Chemical Properties of Milk

1. Color
2. Odor
3. Taste or flavor
4. Specific gravity
5. Freezing point
6. Boiling point
7. Specific heat
8. Viscosity
9. Cream rising
10. Foaming
11. Chemical reaction

F. Factors Influencing Quality

1. Animal health

2. Sanitation
   a. workers
   b. equipment and utensils
   c. barns
   d. animals

3. Feed

4. Storage
   a. heat
   b. freezing

5. Agitation

6. Oxidation

7. Enzyme action

8. Chemical treatment

9. Adulteration
   a. animal medication
   b. insecticides

10. Transporting

11. Stage of lactation

G. Microorganisms in Milk

1. Bacteria
2. Yeasts
3. Molds

H. Biochemical Changes in Milk

   1. Desirable fermentations
   2. Undesirable fermentations

I. Milk Testing

   1. For cream (butterfat)
      a. babcock
      b. others

   2. For buttermilk

   3. DHIA

J. Processing and Distribution

   1. Pasteurizing
   2. Homogenizing
   3. Separating
   4. Packaging
   5. Storing
   6. Wholesale and retail distribution

K. Transportation of Milk

   1. Laws and regulations

   2. Methods
      a. bulk - tanker
      b. jug, bottle, carton

   3. Refrigeration

   4. Distance

   5. Effect on quality (see F)

L. Milk and Public Health

   1. Milk-borne diseases
      a. tuberculosis
      b. undulant fever
      c. others

   2. Protection measures (also see Part VII under Dairy Products) (01.04-01.02-07)
      a. tests
         (1) for bacteria
         (2) for pasteurization
         (3) for residues

Level	Grade
* I/S	9 10 11 12

b. pasteurization
c. cooling

II. Butter — S

A. Trends

1. Research
2. History
3. Consumption rate
4. Consumer demands
5. Principle manufacturing areas

B. Composition and Legal Standards of Butter

1. Butterfat content
2. Water content
3. Others

C. Kinds and Grades of Butter

1. Creamery butter
2. Farm or dairy butter
3. Sweet or unsalted butter
4. Others

D. Physical Characteristics of Butter

1. Body
2. Salt
3. Color
4. Flavor

E. Factors Influencing Butter Making

1. Temperature
2. Size of fat particles
3. Richness of cream
4. Viscosity
5. Sour cream
6. Cream from cows in advanced lactation

F. Tests (also see Item I - Milk Testing under Market Milk) (01.04-01-02-01)

1. For moisture
2. For fat
3. For curd
4. For salt

Level * I/S — Grade 9 10 11 12

5. For health and legal standards
    a. adulteration
    b. foreign matter
    c. bacteria
    d. also see Part VII under Dairy Products (01.04-01-02-07)

G. Manufacturing Butter

H. Packaging and Storing

I. Retailing Butter

III. Cheese — S

A. Trends

1. Research
2. History
3. Consumer demands
4. Consumption rates

B. Types of Cheese

1. Classified by hardness of finish
    a. soft cheese varieties
    b. semi-hard cheese varieties
    c. hard cheese varieties
    d. processed or reworked

2. Classified by product used
    a. sweet milk cheese
    b. sour milk cheese
    c. whey cheese
    d. processed cheese

C. Principles of Production

1. The coagulum
2. Curing
3. Chemical composition
4. Quality of milk

D. Manufacturing Cheese

E. Packaging and Storing

F. Quality Control and Standards

1. See Part VII under Dairy Products (01.04-01-02-07)

01.04-01-02-04
01.04-01-02-05

	Level	Grade			
	* I/S	9	10	11	12
IV. Condensed and Dried Milk	S				
A. Trends					
B. Physical and Chemical Properties					
C. Keeping Qualities					
D. Process of Condensing					
E. Process of Drying (dehydration)					
F. Packaging and Storing					
G. Quality Control and Standards					
1. See Part VII Dairy Products (01.04-01-02-07)					
V. Ice Cream	S				
A. Trends					
B. Composition					
1. Fat					
2. Serum solids					
3. Sugar					
4. Stabilizers					
5. Flavoring materials					
6. Other solids					
7. Total solids					
C. Physical Properties					
1. Water					
2. Air					
3. Crystallizations					
4. Smoothness					
5. Flavor					
6. Color					
7. Odor					
D. Classification of Ice Cream					
1. Plain ice cream					
2. Fruit ice cream					
3. Nut ice cream					
4. Sherberts					
5. Others					
E. Process of Making Ice Cream					
F. Factors Influencing Quality					
G. Packaging and Storing					
H. Quality Control and Standards (see 01.04-01-03-07)					

01.04-01-02-06
01.04-01-02-07
01.04-02-00-00
01.04-02-01-00
01.04-02-02-00

	Level * I/S	Grade 9 10 11 12
VI. Other Dairy Products	S	
VII. Quality Control, Standards and Health Regulations	S	

VI. Other Dairy Products

A. By-Products

1. Skim milk
2. Butter milk
3. Whey

B. Casein

C. Lactose

VII. Quality Control, Standards and Health Regulations

A. Federal Regulations (Inspection and Law Enforcement)

1. U. S. Department of Agriculture
2. Pure Foods and Drug Commission

B. State and Local Regulations (Inspection and Law Enforcement)

1. Public boards of health
   a. local/city (municipal
   b. state

2. Veterinarian (local or state)

3. Medical doctors

C. Certified Milk Regulations

1. Medical Milk Commission
2. American Medical Association

D. Violation Penalties

1. Farmer - producer
2. Processor or manufacturer
3. Wholesaler or retailer

Nonfood Products

Cotton

Tobacco

3

01.04-02-03-00

	Level * I/S	Grade 9 10 11 12
Wool		
I. Trends	S	
A. Research		
B. Geographical Specialization		
C. Consumer Demand		
D. Breeding for Quality		
E. Consumption Rates		
F. History		
II. Virtues	S	
A. Porous and Absorbant		
B. Generates Heat		
C. Superior Insulator		
D. Light Weight		
E. Elastic Nature		
F. Transmit Ultra-Violet Rays		
G. Durability		
H. Dyestuff Holding Ability		
I. Fiber Strength		
J. Noninflammable		
K. Easily Felted or Matted		
III. Uses	S	
A. Carpet		
B. Apparel		
IV. Composition of Fibers	S	
A. Cell Layers		
1. Epidermis		
2. Cortex		
3. Medulla		
B. Chemical		
1. Keratin		
2. Carbon		
3. Oxygen		
4. Nitrogen		
5. Hydrogen		
6. Sulphur		
V. Fleece Characteristics	S	
A. Grease		

1. Natural
2. Acquired
3. Applied

B. Length

C. Density

D. Diameter

E. Variation of Different Body Areas

1. Fineness
2. Length
3. Density
4. Clean Wool Yield

VI. Factors Influencing Quality S

A. Nourishment and Thriftness
B. Trash and Burs
C. Insoluble Paint Brands
D. Shearing Factors

1. Timing
   a. availability of labor
   b. time of lambing
   c. seasonal grazing condition
   d. weight of fleece
   e. flies

2. Keeping wool dry
3. Tag removing
4. Clean shearing facilities
5. Careful handling of sheep
6. Avoiding second cuts
7. Keeping fleeces unbroken
8. Avoiding skin bits
9. Rolling fleece properly
10. Using paper twine to tie fleece
11. Using regulation wool bags
12. Packing each kind of wool separately

VII. Requisites of Wool S

A. Characteristics of Wool

1. Crimp
2. Color
3. Feel

	Level * I/S	Grade 9	10	11	12
B. Purity of Wool					
1. True white fibers					
2. Kemp					
C. Strength of Fiber					
1. Sickness					
2. Feeding					
3. Emotional upsetting					
D. Condition					
E. Cleanliness					
F. Shrinkage					
VIII. Classes	S				
[illegible]. Combing					
B. Clothing					
C. French Combing					
D. Carpet					
IX. Grading	S				
A. Grades					
1. Fine					
2. Medium					
3. Coarse or braid					
B. Methods					
1. Number system					
a. range: Finest to coarse					
b. number: 80 to 36					
c. hanks of yarn					
2. Blood system					
a. fine					
b. ½ blood					
c. 3/8 blood					
d. ¼ blood					
e. low ¼ blood					
f. common					
g. braid					
X. Marketing	S				

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01.04-02-99-00
01.04-99-00-00

	Level * I/S	Grade 9	10	11	12
A. International					
1. Exports					
2. Imports					
B. Domestic					
1. Local buyers					
2. Merchants					
3. Commission houses					
4. Brokers of mill agents					
5. Cooperative associations					
XI. Manufacturing Process	S				
A. Sorting					
B. Dusting and Opening					
C. Scouring					
D. Drying					
E. Carbonizing or Bur Picking					
F. Blending, Oiling and Mixing					
G. Grading					
H. Combing					
I. Spinning					
J. Weaving					
1. Woolens					
2. Worsteds					
K. Knitting and Felting					
L. Dyeing and Finishing					
XII. Laws and Regulations	S				
A. Wool Products Labeling Act of 1939					
1. Wool					
2. Reprocessed					
3. Reused					
4. Virgin					

Other Nonfood Products (Specify)

Other Agricultural Products (Specify)

01.05-00-00-00
01.05-01-00-00

Level * I/S | Grade 9 10 11 12

ORNAMENTAL HORTICULTURE (Production, Processing, Marketing, Services)

Arboriculture (Trees, Shrubs, Vines)

I. Economic Importance in New Hampshire, Northeast and United States — I

II. Occupational Opportunities (See *Encyclopedia of Careers for Vocational Guidance*) — I

III. Classification of Trees, Shrubs and Vines — I

- A. Trees
    1. Evergreen
    2. Deciduous
- B. Shrubs
    1. Evergreen
    2. Deciduous
- C. Vines
    1. Evergreen
    2. Deciduous
    3. Annual
    4. Perennial
    5. Means of climbing
        - a. cling by rootlets or sucker discs
        - b. cling by tendrils
        - c. climb by twining stems

IV. Identification — I

- A. Trees (core list for New Hampshire)
    1. Shape
    2. Coloration (leaves, flowers, fruit, bark, etc)
    3. Growth habits
    4. Growth rates

*I = Introduction / S = Specialization

	Level * I/S	Grade 9 10 11 12
5. Height and size at maturity		
6. Peculiar or distinctive features		
B. Shrubs (a core list)		
1. Shape		
2. Coloration (leaves, flowers, fruit, bark, etc.)		
3. Growth habits (soil, location, spreading, upright, etc.)		
4. Growth rates		
5. Height and size at maturity		
6. Peculiar or distinctive features		
C. Vines (a core list)		
1. Shape		
2. Coloration (leaves, flowers, fruit, etc.)		
3. Method of climbing and support requirements		
4. Growth habits (soil, location, etc.)		
5. Growth rates		
6. Height and size at maturity		
7. Peculiar or distinctive features		
V. Uses of Trees, Shrubs, Vines	S	
A. Enclosure - Barrier - Hedge		
B. Shelter - Shade (Roofing)		
C. Surface - Ground Cover		
D. Color - Foliage (primary) - Flowering (secondary)		
E. Planting around buildings		
F. Wildlife		

01.05-01-00-00
01.05-02-00-00
01.05-02-01-00

	Level	Grade			
	* I/S	9	10	11	12
VI. Cultural Requirements	S				
A. Planting					
B. Propagation					
C. Soil Requirements					
D. Nutrient Requirements					
E. Spacing					
F. Pruning and Trimming					
G. Training					
H. Trellis or Latticework					
I. Digging and Balling for Shipping					
VII. Insect and Disease Control (see 01.01-02-06-00, 01.01-02-07-00)	S				
VIII. Marketing	S				
A. State and Federal Regulations					
B. Types of Markets or Outlets					
C. Pricing					
D. Grading					

Floriculture

	Level	9	10	11	12
I. Production					
A. Economic Importance in New Hampshire, Northeast and United States	I				
B. Occupational Opportunities (See Encyclopedia of Careers for Vocational Guidance)	I				
C. Commercial/Home Grouping of Flower Crops	I				
1. Bench Crops					
a. Carnation					
b. Roses					
c. Snapdragon					
d. Chrysanthemum					
2. Pot Plants					
a. Lilies					
b. Poinsettia					
c. Chrysanthemum					
d. Bulbs					
3. Outdoor Crops					
a. Chrysanthemum					

b. Asters
c. Gladiolus
d. Bedding plants (started in greenhouse)
(1) Petunias
(2) Marigolds
(3) Salvia

D. Cultural Requirements S

1. Bench crops
a. preparation of beds and flats
b. soil and soil media
c. propagation
d. spacing of seed or plants
e. transplanting
f. using individual plant containers
g. thinning
h. fertilizing
i. watering and humidity
j. temperature requirements
k. forcing and shading
l. light requirements
m. pinching and disbudding
n. staking and tying
o. cutting

2. Pot plants I
a. soil, soil media, and soil reinforcement
b. growing in flats
c. shifting of plants
(1) transferring seedlings to small pots/containers
(2) transferring to "finishing" pots/containers
d. selection of proper pot sizes
e. propagation
f. fertilizing
g. watering and humidity
h. light requirements
i. temperature requirements
j. forcing
k. support requirements

3. Outdoor crops
a. soil requirements
b. bed preparation
c. planting
(1) time
(2) location
(3) spacing
(4) compatability

	Level	Grade			
	* I/S	9	10	11	12
d. means of propagating					
e. watering					
f. fertilizing					
g. mulching and winter care					
E. Insects and Diseases Control (see 01.01-02-07-00)	S				
F. Securing Stock Plants, Cuttings, Seeds and Bulbs	S				
1. Sources					
2. Reputation of supplier					
3. Tested/certified					
4. Quality/cost					
5. Proper selection					
a. germination					
b. adaptability					
6. Method of shipping					
7. State and Federal regulations					
G. Care and Storage of Stock and Bulbs	S				
1. Types of storage facilities or structures					
2. Controlling temperature					
3. Controlling humidity					
4. Protecting from insects, rodents, and disease organisms (see 01.01-02-07-00)					
H. Post Harvest Physiology	S				
1. Processes affecting quality					
a. water absorption and transpiration					
b. respiration					
c. temperature					
d. relative humidity					
2. Refrigeration					
3. Use of chemicals, etc.					
4. Package or container requirements					
I. Marketing Flowers	S				
1. Market days (consult Florist Calendar)					

01.05-02-01-00
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Level * I/S — Grade 9 10 11 12

2. Kinds of markets
    a. florist
    b. home
    c. commercial

3. Grading

4. Packaging or packing

5. Consumer units

6. Pricing

II. Floral Design and Arrangement

A. Occupational Opportunities (See Encyclopedia of Careers for Vocational Guidance) I

B. Trends and Developments S

1. The consumer demands

2. Natural grown material

3. Synthetic material (plastic, glass, etc.)

C. Flowers to be Used S

1. Kinds of Flowers

2. Cutting the Flowers
    a. how to cut
    b. when to cut
    c. caring for cut flowers

3. Conditioning flowers
    a. charring
    b. hammering
    c. stripping thorns, spines, etc.

D. Foliage to be Used S

1. Kinds of plant

2. Sources

01.05-02-02-00
01.05-03-00-00

	Level * I/S	Grade 9	10	11	12
a. florist					
b. vegetable garden					
3. Selection					
E. The Container	S				
F. Mechanical Aids	S				
1. Tools					
2. Pinholders					
3. Wire					
4. Other accessories					
G. Design and Arrangement	S				
1. Principles and use of color					
2. Main lines					
3. The center of interest					
4. The container and the design					
5. Flowers in season					
6. Placing arrangement					
a. home					
(1) front hall					
(2) living room					
(3) dining room					
b. display windows					
c. exhibits					
d. public buildings					
7. Constructing and using corsages					
8. Constructing and using floral pieces (wedding and funeral)					
9. Constructing and using Christmas wreaths, sprays, etc.					

Greenhouse Management and Operation

I. Occupational Opportunities (See Encyclopedia of Careers for Vocational Guidance)	I				

	Level * I/S	Grade 9	10	11	12
II. Trends and Developments	I				
III. Greenhouses	S				
A. Types					
1. Lean-to					
2. Uneven span					
3. Even span					
4. Ridge and furrow					
5. Curvilinear					
B. Types of Construction					
1. Wood frame					
2. Semi-iron					
3. Iron					
4. Covering					
a. glass					
b. plastic					
C. Sizes					
1. Width					
a. walks					
b. benches					
2. Length					
3. Providing for expansion					
D. Location of the Greenhouse					
1. Markets					
2. Convenience					
3. Space requirements					
4. Drainage					
5. Cost					
6. Exposure					
E. Methods of heating					
1. Hot water					
2. Steam					
3. Electric					
F. Greenhouse Equipment (manual/automatic)					
1. Ventilation					
2. Water					
a. irrigation or sprinkler systems					
b. washers					

	Level	Grade			
	* I/S	9	10	11	12
3. Lighting					
4. Control panels/units					
5. Pumps					
IV. Management/Operation	S				
A. Temperature					
1. Cool season crops					
2. Warm season crops					
3. Day/night requirements					
B. Ventilation					
C. Watering					
1. When and how					
2. Effects of over and under watering					
D. Soils					
1. Mixing					
2. Fertilizing					
3. Sterilizing					
E. Other Plant Growth Media-treatment					
F. Seeding and Transplanting					
1. Methods					
2. Timing					
3. Hardening-off					
G. Control of Insects and Diseases					
H. Response to Light/Shading					
I. Equipment					
1. Hand					
2. Power					
J. Maintaining the Greenhouse Structure					
1. Painting (see 01.03-04-12-00)					
2. Treating					
3. Glazing (see 01.03-04-11-00)					
V. Other Plant Growing Structures	S				
A. Types					

01.05-03-00-00
01.05-04-00-00
01.05-04-01-00

Level * I/S — Grade 9 10 11 12

1. Hotbeds
2. Cold frames
3. Cloth houses
4. Lath houses
5. Hotcaps

B. Construction and Materials
C. Location
D. Methods of Heating
E. Uses

Landscaping

I. Landscape Design

A. Importance of Landscape Designing — I

B. Occupational Opportunities (see *Encyclopedia of Careers for Vocational Guidance*) — I

C. Introduction — I

1. History and development
2. Trends
3. Kinds of design plans and models

D. Drawing Techniques (see 01.03-04-01-00) — S

1. Materials needed
2. Lettering techniques
3. Form
4. Scales and measuring

E. Use of Symbols in Landscape Drawings — S

1. Plants
   a. coniferous
   b. deciduous
   c. others

2. Construction features
   a. walks and drives
   b. fences
   c. others

F. Using Basic Design Principles — S

1. Axial relationships
2. Balance
3. Harmony
4. Dividing the grounds into landscape areas

Level * I/S — Grade 9 10 11 12

- a. public
- b. private
  - (1) formal
  - (2) informal
- c. service and recreation

5. Structures and use
   - a. hedges
   - b. gates
   - c. walls and fences
   - d. statuary
   - e. retaining walls
   - f. others

6. Utility and beauty

7. Theme

8. Color and lighting

II. Grounds Maintenance

- A. Economic Importance in New Hampshire, Northeast and United States — I

- B. Aesthetic Values and Importance — I

- C. Occupational Opportunities (See *Encyclopedia of Careers for Vocational Guidance*) — I

- D. Grounds Maintenance Problems — S

  1. Location
     - a. land/soils
     - b. climate
     - c. topography
     - d. vegetation

  2. Structures and buildings
     - a. neighborhoods
     - b. lots
     - c. houses, etc.

  3. People
     - a. composition (age and sex)
     - b. income levels
     - c. attitudes
     - d. race, religion, national origin

	Level * I/S	Grade 9	10	11	12
E. Developing the Landscape Areas	S				
1. Public area					
a. lawns					
b. planting around buildings (foundation)					
c. accent plantings					
d. walks, drives, etc.					
2. Private area					
a. practical use arrangements					
b. arrangements for beauty					
c. focal points					
d. shading					
e. screening and fencing (enclosure)					
f. patios and terraces					
g. electricity, etc.					
3. Service and Recreation area					
a. practical use arrangements and location					
b. screening and fencing					
c. structures and/or shelters					
d. equipment					
e. utilities (water, electricity, etc.)					
F. Practical Considerations	S				
1. Grading					
2. Treatment of changes in levels					
3. Drainage					
a. surface					
b. subsurface					
4. Soil conditioning					
5. Utilities					
a. water lines					
b. electric lines and conduit					
c. gas lines					
d. sewer					
6. Construction of walks and driveways					
7. Construction of patios, terraces, etc.					
8. Construction of garden structures and shelters					

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01.05-05-00-00

	Level * I/S	Grade 9 10 11 12
9. Construction of fences, walls, etc.		
10. Construction of pools and ponds		
11. Local and State regulations a. codes and ordinances b. specifications c. permits		
12. Establishing lawns		
13. Planting trees, shrubs, and vines		
14. Fertilizing		
15. Watering		
16. Insect and disease (pests) control		
17. Selecting and ordering plants, etc.		
18. Estimating costs		
19. The landscape design or plan		
20. Plant care requirements		

Nursery Management and Operation

	Level * I/S	Grade 9 10 11 12
I. Economic Importance in New Hampshire, Northeast and United States	I	
II. Trends and Developments	I	
III. Occupational Opportunities (See Encyclopedia of Careers for Vocational Guidance)	I	
IV. Identifying Plant Materials (See 01.05-01-00-00) (Deciduous and Evergreen Trees, and Shrubs - develop core list)	S	
A. Visual System (Appearance of Plant) 1. Common name 2. Scientific name (may be deleted) 3. Height 4. Rate of growth 5. Shade density		

	Level * I/S	Grade 9	10	11	12
6. Flower					
7. Fruit					
8. Leaf (shape and fall color)					
9. Bark					
10. Strength of wood					
11. Disease resistance					
12. Common uses					
B. Keyed System					
V. Types of Nurseries or Nursery Businesses	S				
A. Seedling Production (PROPAGATION)					
B. Growing Young Plants to Marketable Size (PRODUCTION)					
C. Selling Marketable Stock (SALES)					
D. Combinations					
VI. PROPAGATION of Nursery Stock	S				
A. Propagating Structures or Beds					
1. Greenhouses					
2. Outdoor propagating beds					
B. Service Structures					
1. Head house					
2. Storage house					
3. Heating plant					
4. Alley house					
C. Growing Seedling Plants					
1. Propagation by seed					
a. collecting fruit					
b. extracting and drying seed					
c. seed treatment					
d. seeding					
2. Propagation by vegetative means					
a. cuttings					
(1) hardwood					
(2) softwood					
b. grafting and budding					
c. layering					

01.05-05-00-00

	Level * I/S	Grade 9 10 11 12
VII. The PRODUCTION of Nursery Stock	S	

A. Laying out Land

B. Lining-out (transplanting)

1. Moving from propagation to production unit
    a. "lifting" the plant
    b. "placing" the plant

2. Means of transplanting
    a. hand
    b. mechanical

3. Spacing

4. Fertilizing, watering, treating, etc., at first transplanting (see item 1 above)

C. Developing Root System

1. Root-pruning
    a. When to cut/prune
    b. methods of cutting/pruning

2. Kinds of trees or shrubs to be considered

D. Developing Tree Form

1. Top-pruning
    a. kind of tree or shrub
    b. when to cut and frequency

2. Tools or equipment to be used

E. Cultivation and Weed Control

1. Importance

2. Methods and types
    a. chemical
    b. mechanical
    c. frequency

3. Costs

F. Insect and Disease Control (see 01.01-02-07-00)

1. Importance
2. Identification
3. Control

	Level * I/S	Grade 9	10	11	12
G. Fertilizing					
1. Soil test analysis					
2. Application rates					
H. Watering					
VIII. The SALES Unit	S				
A. Location and General Appearance					
B. Display or Show Area					
C. Sales Area					
1. Reception and display room					
2. Wrapping, storing, toilet facilities, etc.					
3. Facilities or structures for potted plants, etc.					
D. Parking Areas and Drives					
E. Service Area					
IX. Preparing Nursery Stock for Sale	S				
A. Plant Removal					
1. Time to remove					
a. water absorption					
b. transpiration					
2. Methods					
a. lifting without soil - bare root					
b. balling and burlapping					
B. Storing					
1. Inside storage					
2. Outside storage					
3. Maintaining life processes - minimum rate					
a. temperature					
b. relative humidity					
c. ventilation					

	Level * I/S	Grade 9 10 11 12

C. Grading

1. Refer to American Association of Nursery Men's "Horticultural Standards"

    a. age
    b. size of top (height and diameter of spread
    c. root system
    d. trunk diameter
    e. tree or shrub
    f. evergreen or deciduous
    g. narrow-leaved or broad-leaved

2. Terminology

3. Labeling

D. Packing

1. Type of package
    a. kind of plant
    b. size of plant

2. Means of shipment

3. Recommendations of American Association of Nurserymen

4. Local, State, and Federal Trade and Licensing regulations

E. Business Management (see 01.01-04-00-00)

1. Records and accounts
2. Financing
3. Insurance
4. Contracts and legal management

X. Maintaining Landscape Plants — S

A. Pruning Landscape Plants

1. Reasons for pruning

2. When to prune
    a. early blooming deciduous shrubs
    b. late blooming deciduous shrubs
    c. broad-leaved evergreens
    d. narrow-leaved evergreens
    e. other

	Level * I/S	Grade 9	10	11	12
3. Shearing hedges					
B. Fertilizing Landscape Plants					
1. Trees					
2. Shrubs					
3. Broad-leaved evergreens					
C. Mulching Landscape Plants					
D. Controlling Weed, Insects, Diseases (Pests)					
E. Watering Landscape Plants					
F. Winter Protection					
1. Additional mulching					
2. Fertilizing					
3. Chemical treatment - spray					
4. Wrapping					
5. Shelters					
G. Transplanting Woody Ornamentals					
1. Soil modification					
2. Planting (bare-rooted and balled and burlapped) a. time b. method or technique					
3. Wrapping and staking trees					
XI. Plant Patents	S				
A. Laws, Regulations, etc.					
Turf Management					
I. Economic Importance in New Hampshire, Northeast and United States	I				
II. Occupational Opportunities (See Encyclopedia of Careers for Vocational Guidance)	I				
III. Identifying Turfgrasses (a core list)	I				
A. Vegetative Characteristics					

	Level * I/S	Grade 9	10	11	12
1. Leaf					
a. blade					
b. sheath					
2. Bud leaf					
a. rolled					
b. folded					
3. Leaf collar (ligule)					
4. Stem					
a. rhizomes					
b. stolons					
IV. Selection of Turfgrasses	S				
A. Adaptable to Climate					
1. Cool climate grasses					
2. Mild climate grasses					
3. Dry climate grasses					
B. Need or Use					
1. Use					
2. Temporary					
3. Permanent					
C. Advantages/Disadvantages of Various Grasses					
D. Quality of Seed and Mixture					
E. Soil Condition					
F. Lawngrass Substitutes					
V. Establishing a Lawn	S				
A. Seedbed Preparation					
1. Conditioning					
2. Grading					
3. Leveling					
4. Fertilizing and liming					
B. Time of Sowing and Seeding Rates					
C. Method of Sowing					

Level * I/S — Grade 9 10 11 12

D. Mulching

E. Need for Barriers

F. Watering (time and amount)

G. Mowing New Grass

H. Sodding or Planting Stolons

I. Fertilizing (time, amount, type, recommendations)

J. Treating for Pests

VI. Maintaining Home Lawns and Other Turf Areas (Home, Athletic Fields, Golf Courses, Parks, Other Lawns) — S

A. Maintaining

1. Soil testing

2. Fertilizing according to test and requirements

3. Lime requirements

4. Using plugs or sod pieces

5. Spot seeding ("mud" seeding)

B. Mowing

1. Mowing height
   a. type of grass
   b. use of turf

2. Frequency of mowings
   a. uses of turf
   b. moisture
   c. temperature
   d. season, etc.

3. Mowing practices

4. Clippings

5. Accumulation of plant material (thatch)

	Level * I/S	Grade 9 10 11 12
6. Edging and Trimming		
7. Aeration		
C. Watering		
1. Time to water		
2. Amount to use		
3. Equipment used/means of applying water		
4. Sub-irrigation system		
D. Controlling Lawn Pests		
1. Identification of problem		
2. Control program		
E. Pet Damage		
VII. Renovating a Lawn	S	
A. Causes of Poor Turf		
1. Poor maintenance practices		
2. Grasses not adapted to situation		
3. Competition from other plants a. minerals b. water c. shading		
4. Soil compaction		
5. Poor drainage		
6. Pet damage		
7. Winter kill		
8. Heavy matting		
9. Insect and/or disease		
10. Physical damage		

Level * I/S	Grade 9 10 11 12

B. Renovating Large Sections

  1. Recognize cause of failure

  2. Develop plan of renovation

    a. treating to destroy or remove all turf material

    b. correcting cause of failure

    c. re-establishing the lawn (see part V)

C. Renovating small Areas or Spots

  1. Recognize cause of failure

  2. Correct cause

  3. Spot seeding, "mud" seeding, use of plugs, stolons, etc.

Other Ornamental Horticulture

01.06-00-00-00
01.06-01-00-00
01.06-02-00-00
01.06-03-00-00
01.06-04-00-00

Level * I/S — Grade 9 10 11 12

AGRICULTURAL RESOURCES

General Survey — I

- I. Economic Importance in New Hampshire, Northeast and United States
- II. Occupational Opportunities (See Encyclopedia of Careers for Vocational Guidance)
- III. Trends in Agricultural Resources (United States)
    - A. Conservation (Forests, Soil, Wildlife, Water, Air and Fish)
        - 1. History (past)
        - 2. Present trends
        - 3. Future
    - B. Utilization (Forests, Soil, Wildlife, Water, Air and Fish)
        - 1. History (past)
        - 2. Present trends
        - 3. Future
    - C. Services (Forests, Soil, Wildlife, Water, Air and Fish)
        - 1. History (past)
        - 2. Present trends
        - 3. Future
- IV. "World Situation" and Agricultural Resources (Conservation, Utilization and Services)

Forests (See Forests under Forestry) (See 01.07-01-00-00) — S

Recreation (See Recreation under Forestry) (See 01.07-05-00-00) — S

Soil — S

- I. Materials of the Earth's Surface
    - A. Earth Chemistry

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*I = Introduction / S = Specialization

Level	Grade
* I/S	9 10 11 12

   1. Elements
   2. Compounds
   3. Valence

B. Minerals

   1. Common types
   2. Identification
   3. Properties of
   4. Silicious
   5. Non-metalic
   6. Metal Ore
   7. Gem

C. Rocks

   1. Igneous
   2. Sedimentary
   3. Metamorphic
   4. Structure
   5. Granitization

II. Forces That Shape the Earth's Surface

A. Diastrophism

   1. Landform
   2. Earth Crust (rise and fall)
   3. Cause diastrophism
   4. Effect of earth movement
   5. Earthquake
   6. Physiographic Provinces

B. Mountains

   1. History
   2. Existing
   3. Marine

C. Plains

   1. Delta
   2. Flood

D. Plateaus

   1. Types

01.06-04-00-00
01.06-05-00-00

Level * I/S	Grade 9 10 11 12

E. Volcanism

1. Extrusive
2. Types of eruptions
3. Volcanic features
4. Activity in historic times
5. Intrusive
6. Predicting volcanic eruptions

III. Forces That Sculpture the Earth's Surface (see 01.01-02-02-00)

A. Weathering

1. Mechanical
2. Chemical
3. Results of weathering
4. Soil formation

B. Erosion (see Water I, F and D, C and Air D, D)

1. Agents

2. Gravity
   a. water
   b. glaciers
   c. air
   d. man

3. Conservation

Wildlife (See Also Recreation for Game Farms, Hunting Areas, etc., 01.07-05-00-00) I

I. Wildlife and Man

A. History

B. Wildlife Values

1. Recreation
2. Aesthetic
3. Commercial

C. Wildlife as a Resource

1. Present status
2. Conservation

II. Wildlife in America

A. Destruction and Conservation

1. Californian example
2. National impact

III. Ecology

A. Biotic Community and Ecosystem

1. Functions of ecosystem
    a. minerals
    b. water
    c. energy

2. Succession

3. Failure of man and the ecosystem

4. Distribution of Biotic Communities

5. Biomes

IV. Habitat

A. Carrying Capacity

1. Food
2. Effects on plants
3. Diets
4. Seasons
5. Soils
6. Improvement of food supplies
7. Cover
8. Water
9. Limiting factors

B. Biotic Succession and Wildlife

1. Aquatic animals
2. Grassland and game
3. Forests and game
4. Climax and stability

C. Successional Classification of Wildlife

1. Climax
2. Midsuccessional species
3. Low successional species

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	Level * I/S	Grade 9 10 11 12
V. Characteristics of Wildlife Population		
A. Density		
B. Structure		
C. Natality		
D. Mortality		
1. Weather		
2. Hunting		
3. Starvation		
4. Stress		
5. Disease		
6. Predation		
VI. Wildlife Territory and Travels		
A. Movement		
1. Migration		
2. Home range		
B. Group Sized Spacing		
1. Territory		
VII. Dynamics of Population		
A. Growth		
B. Stabilization Failure		
C. Cycles		
D. Surplus		
E. Irruptive Populations		
VIII. Wildlife and Land-Use Patterns		
A. General		
B. Changes in Land-Use Practices		
C. Population (human) Growth and Wildlife		
IX. Endangered Species		
A. Extinction		
Water	I	
I. Running Water		

Level	Grade
* I/S	9 10 11 12

A. Ground Water

1. Permeability
2. Water table
3. Effects of ground water

B. Surface Water

1. Eroding
2. Transport of material
3. Deposits by streams

C. Anatomy of a River System

1. How a river begins
2. Development of river valleys

D. River Cycle

1. Beginning (Youth Stage)
2. Maturity
3. Old age
4. Interruptions

E. Erosions by Moving Water

1. Laminar flow
2. Turbulent flow

II. Glacial Ice

A. Origin

1. Formation
2. Types
3. Movements

B. Glacial Erosion

1. Valley glacier
2. Continental glacier

C. Glacial Deposits

1. Types

2. Deposits
    a. direct
    b. miltwater
    c. glacial drift

D. Glacial Periods

1. Four great periods
2. Possible causes

E. Movement of Glaciers

1. Gravity
2. Weight
3. Thickness of ice

III. Water Cycle

A. Hydrologic
B. Flood
C. Water Conservation

IV. Water in the Earth's Crust

A. Water Table

B. Wells

1. Artesian
2. Driven point
3. Spring

V. Lakes

A. Origin and History
B. Salt
C. Swamps

VI. Oceans

A. Oceanography

B. Exploring the Sea

C. Sea Floor

1. Ocean basins
2. Sediments

D. Sea Water

1. History
2. Composition
3. Minerals
4. Temperatures

01.06-06-00-00
01.06-07-00-00

	Level	Grade
	* I/S	9 10 11 12
E. Ocean Waves		

- 1. Characteristics
- 2. Waves and wind
- 3. Waves near the shore
- 4. Giant waves

F. Ocean Currents

- 1. Cause
- 2. Surface currents
- 3. Deep currents

G. Tides in the Ocean

- 1. Tidal pulse
- 2. Currents
- 3. Power

H. Gulf Stream

	Level	Grade
Air - Earth's Atmosphere	I	

I. Air

A. Gases of the Atmosphere

- 1. Origin
- 2. Conservation

B. Roof of Air

- 1. Troposphere
- 2. Stratosphere
- 3. Ionosphere
- 4. Air Pressure

C. Sun

- 1. Trapping the sun's energy
- 2. Effects of sunlight

D. Carbon Dioxide

II. Winds

- A. Atmospheric Circulation
- B. Local
- C. Earth's Heat Budget

Level	Grade
* I/S	9 10 11 12

D. Wind Erosion and Disposition

  1. Transportation by wind
  2. Deposits made
  3. Abrasion

III. Water

A. Atmospheric Moisture

  1. Absolute humidity
  2. Relative humidity

B. Clouds and Fog

  1. Dew point
  2. Formation of clouds
  3. Types of clouds
  4. Types of fog

C. Precipitation of Moisture

  1. Formation of rain
  2. Snow
  3. Sleet and hail

D. Sea Salt and Raindrops

IV. Weather Changes

A. Air Masses

  1. Origin

B. Weather Fronts

  1. Formation
  2. Storm centers

C. Severe Storms

  1. Local
  2. Hurricanes
  3. Tornadoes
  4. Thunderstorms

D. Weather Changing

  1. Silver iodide and dry ice
  2. Brute force technique
  3. Solar energy changed in amount

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Level * I/S | Grade 9 10 11 12

E. Weather Predictions

   1. Instruments
   2. Weather maps
   3. Weather forecasting
   4. Weather satelites

Fish - Including Farm and Hatcheries (CLASSIFICATION AND DESCRIPTION) I

I. Fresh Water Game Fish (Cold Water)

   A. Trout
   B. Salmon
   C. Smelts
   D. Bass
   E. Pike
   F. Pickerel
   G. Muskellunge
   H. Perch
   I. Bluegills
   J. Sunfish
   K. Bull Heads
   L. Crappies

II. Management of Streams, Ponds, and Lakes for Fishing

   A. Importance
   B. Sport
   C. Aesthetic
   D. Public Health
   E. Food
   F. Irrigation
   G. Power
   H. Domestic and Industrial Water Supplies

III. Stream Management

   A. General Considerations

      1. Maximum Utilization (Sport, Water Supply, etc.)

      2. Research

   B. Formation of Management Plans and Procedures

Level	Grade
* I/S	9 10 11 12

1. Administrative
    a. coordination of research
    b. interpretations of findings
    c. education of public
    d. securing funds

2. Research
    a. habitat requirements
    b. determine existing environmental conditions
    c. devising and carrying out proper methods and procedures
    d. managing fish population for efficient production

3. Operative

IV. Habitat Requirements for Fish

A. Suitable Water Supply
B. Adequate Spawning Facilities
C. Abundant Food Supply
D. Accessible Shelter
E. Water Temperature

V. Managing the Fish Population

A. Stocking
B. Regulations
C. Control of Preditors and Competitors
D. Population Manipulation

VI. Farm Ponds

A. Size of Water Shed
B. Suitability of Pond for Fish
C. Construction of the Pond
D. Fencing off Pond
E. Vegetation of Banks
F. Pond Edges Maintained
G. Size and Depth Requirements
H. Selection of Species
I. Stocking
J. Harvesting

VII. Farm Pond Fertility and Fertilization

A. Advantages and Disadvantages

B. Application
    1. Organic
    2. Inorganic
    3. Lime

01.07-00-00-00
01.07-01-00-00
01.07-02-00-00

	Level	Grade			
	* I/S	9	10	11	12
FORESTRY AND RECREATION					
Forests					
I. Economic Importance in New Hampshire, Northeast and United States	I				
II. Occupational Opportunities	S				
Forest Protection					
I. Forest Disease	S				
A. Introduction to Forest Diseases					
B. Terminology of Disease					
C. Classification of Diseases					
D. Major Disease Problems					
E. Decays and Discolorations in Northern Hardwoods					
F. Logging Wounds in Northern Hardwoods					
G. Beech Bark Disease					
H. White Pine Blister Rust					
I. *Fomes Annosus*					
J. Oak Wilt					
K. Ash Dieback					
L. Dutch Elm Disease					
II. Forest Insects (see 01.01-02-06-00)	S				
A. Insect Classification					
B. Insect Structure					
C. Insect Development					

*I = Introduction / S = Specialization

Level * I/S
Grade 9 10 11 12

D. Ecology and Control (see 01.01-02-07-00)

1. Biotic factors
a. reproduction
b. nutritional
c. parasites and predators

2. Physical factors

E. Study of Major Forest Insects

1. White pine weevil
2. Spruce budworm
3. European spruce sawfly
4. Beech scale
5. Pales weevil
6. Gipsy moth
7. European pine sawfly

III. Fire Protection S

A. Scope of Fire Protection

1. Fire prevention
2. Fire suppression

B. Fire Behavior

1. Principles of combustion
2. Forest fuels
3. Weather
4. Topography

C. Fire Effects

1. On trees
2. Forest microclimate and vegetation
3. On soil

D. Fire Prevention

1. Reducing risk
a. major causes of fires
b. frequency of occurrences

2. Prevention methods

3. Reduction of hazard

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01.07-03-00-00

Level * I/S — Grade 9 10 11 12

E. Suppression Methods

1. Tactics

2. Methods
a. direct control
b. indirect control

3. Line crew organization

4. Manner of building the fire line
a. one lock method
b. progressive method
c. rotary method

F. Use of Hand Tools and Equipment

G. Use of Water

1. Back-pack pumps
2. Power pumps and gravity systems

H. Problems of Fire Danger Rating

1. Fire danger rating system
2. Burning index
3. Build-up index

I. Fire Control Planning

1. Rate of spread
2. Resistance to control

Logging (Harvesting and Transportation)

I. Planning the Timber Harvest — S

A. Timber Available

1. Location of timber
2. Distribution
3. Volume
4. Tree sizes and species

B. Market Demand for Type of Product

C. Topography

	Level	Grade			
	* I/S	9	10	11	12
II. Timber Estimating	S				
A. Systems and Function					
1. 100%					
2. Strip					
3. Plots					
4. Point sampling					
B. Type Mapping					
C. Design of Cruise					
D. Calculations and Presentation					
III. Periodic Annual Increment	S				
A. Normal Yield Tables					
B. Site Index					
1. Determination					
2. Growth Curves					
3. Stand Density					
C. Site Quality					
IV. Timber Sales	S				
A. Federal Timber Sales					
1. Rob Brook Sale					
2. Church Pond Sale					
B. Private Timber Sales					
1. Large Land Ownership					
2. Small Woodlot Ownership					
V. Safety in Sawlog and Pulpwood Production	S				
A. Importance of Safety					
B. Types of Accidents					
C. Causes of Accidents					
D. A Logging Safety Program					
VI. Logging Tools and Equipment	S				
A. Axe					
B. Crosscut Saw					

		Level * I/S	Grade 9	10	11	12
C.	Bowsaw					
D.	Powersaws					
E.	Wedges					
F.	Peavies, Cant Hook, Pulp Hook					
VII.	Timber Marking	S				
A.	Silviculture Specifications					
B.	Equipment					
VIII.	The Felling Operations	S				
A.	Sizing up the Tree					
B.	Undercut					
C.	Backcut					
D.	Leaning and Lodged Trees					
E.	Safety Precautions					
IX.	Log Bucking, Scaling and Grading	S				
A.	Bucking Procedures					
B.	Trim Allowance					
C.	Use of Scale Stick					
D.	White Pine Log Grades					
E.	Hardwood Log Grades					
X.	Felling, Bucking and Skidding Time Studies	S				
A.	Loading Scoot					
B.	Unloading Scoot					
C.	Travel Time - Skidding Distances					
XI.	Skidding and Yarding Systems	S				
A.	Cable Systems					
1.	High lead					
2.	Skyline					
3.	Modifications of the two main types					
B.	Crawler Tractors					
1.	Skidding Methods					
a.	arch skidding					
b.	pan and other anti-friction devices					
c.	scoot and boom					
d.	ground skidding--cable or chains; tongs					

	Level * I/S	Grade 9	10	11	12
2. Choice of machines					
a. production costs					
b. topography					
c. size of operation					
d. products being harvested					
C. Rubber-Tired and Rubber-Tracked Vehicles					
1. Makes of machines					
a. timberjack					
b. timberskidder					
c. tree farmer					
d. bombardier					
e. others					
2. Choice of machines					
D. Harvesting Machines					
E. Horses					
XII. Skid Trails and Landings	S				
A. Location					
B. Maintenance					
XIII. Logging Roads	S				
A. Standards of Construction					
B. Locating the Road					
1. Basic considerations					
2. Method of locating road					
3. Use of grade and slope stakes					
C. Construction					
1. Clearing					
2. Design and standards					
3. Drainage					
4. Bridges					
D. Maintenance and Rights-of-Way					
XIV. Trucking	S				
A. Types of Trucks for Logging					
B. Trucking Costs					
C. Safety in Operating					

	Level	Grade			
	* I/S	9	10	11	12
XV. Chain Saw Cost Analysis	S				
A. Operator					
B. Method of Bucking					
C. Species of Wood					
XVI. Tree Length vs. Log Length Logging	S				
XVII. Multi-Product Logging	S				
A. Forest Management Considerations					
B. Costs					
C. Marketing					

Wood Utilization

	Level * I/S	Grade 9	10	11	12
I. The Woody Plant	S				
A. Post Cambial Growth of the cell					
B. Chemical Components of the Plant Cell Wall					
C. Structural Organization of the Cell Wall					
II. Physical Nature of Wood	S				
A. Nonmechanical Properties of Wood					
1. Moisture content of wood					
a. determination of moisture content					
b. location of water in wood					
c. moisture equilibrium of wood					
d. moisture movement in wood					
2. Dimensional changes in wood					
3. Specific gravity and density of wood					
4. Other properties of wood - thermal and electric					
B. Mechanical Properties of Wood					
1. Definition of terms					
2. Effect of specific gravity on strength of wood					

	Level * I/S	Grade 9	10	11	12
3. Effect of moisture content on strength of wood					
4. Duration of stress					
5. Effect of temperature on strength of wood					
III. Variability of Wood Within a Species	S				
IV. Natural Defects in Wood	S				
A. Cross Grain in Wood					
1. Spiral grain 2. Diagonal grain					
B. Knots					
C. Reaction Wood					
1. Compression wood 2. Tension wood					
D. Growth Stresses					
1. Shakes 2. Brittle heart 3. Compression failures					
E. Brashness					
F. Frost Injuries					
G. Pitch Defects					
H. Bark Pockets					
V. Defects Due to Seasoning and Machining	S				
A. Seasoning Defects					
1. Check 2. Warping 3. Casehardening 4. Reverse casehardening 5. Collapse 6. Honeycombing					
B. Machining Defects					
1. Raised grain 2. Chipped or torn grain					

	Level * I/S	Grade 9	10	11	12
VI. Wood Deterioration and Stains	S				

A. Deterioration Caused by Fungi

1. Wood destroying fungi
    a. dry rot
    b. soft rot
    c. characteristics of decayed wood

2. Sap stains
    a. molds
    b. true sap-stain fungi

B. Deterioration Caused by Bacteria

C. Natural and Chemical Stains

D. Weathering of Wood

E. Deterioration Caused by Insects

1. Insect damage in wood before it is utilized
    a. pith flecks
    b. pin holes
    c. grub holes
    d. black streak in western hemlock

2. Insect damage to wood in service
    a. powder-post beetle damage
    b. furniture beetle
    c. termites

F. Defects Resulting from the Activities of Marine Borers

G. Natural Durability of Wood

VII. The Sawmill Industry	S				

A. Historical Development
B. Economic Importance of Lumber Manufacturing
C. Kinds of Sawmills
D. Sawmill Layout

VIII. Sawmill Machinery	S				

A. Essential Operations

		Level * I/S	Grade 9 10 11 12
B.	Breakdown of Logs into Boards		
	1. Circular headsaw		
	2. Band headsaw		
C.	Cutting Boards Lengthwise		
D.	Cutting Boards Crosswise		
E.	Power Requirements		
IX.	Principles of Sawing	S	
A.	Thickness of Cant		
B.	Alive vs. Around Sawing		
C.	Slabbing		
D.	Grade Sawing		
E.	Sawing Order		
F.	Setting Taper		
X.	Changing Sawmill Industry	S	
A.	Demand for Wood		
B.	Portable vs. Stationary		
C.	Size of Mills		
D.	Equipment		
E.	Log Supply and Methods of Procurement		
XI.	Sawmill Production	S	
A.	Efficiency		
B.	Production Costs		
C,	Non Productive Time--Delay Time		
D.	Types and Arrangement of Equipment Effect on Production		
E.	Replacing Men With Equipment		
F.	Band vs. Circular Saws		
XII.	Quality Control in Sawmill Operation	S	
A.	Function or Purpose		
B.	Statistical Basis		
C.	$\bar{X}$ Chart		
D.	$\bar{R}$ Chart		

	Level * I/S	Grade 9	10	11	12
XIII. Hardwood Grade Sawing	S				
A. Utilization and Variability of Species					
B. Products--Use Classes					
C. External Log Defects					
D. Technique of Hardwood Grade Sawing					
XIV. Utilization of Sawmill Waste	S				
A. History of the Pulp Chipping Program					
1. Producer's viewpoint					
2. Consumer's viewpoint					
B. Factors Influencing Volume of Sawmill Residue Produced					
C. Debarking Logs					
1. Types of debarkers					
2. Estimated cost of owning and operating a log debarker					
3. Case example					
D. Chipping Slabs and Edgings					
1. Chip low valued lumber?					
2. Cost of owning and operating a chipper					
XV. Softwood Lumber Grading	S				
A. Use Classification					
B. Size Classification					
C. Standard Grading Rules for Northern White Pine					
XVI. Hardwood Lumber Grading	S				
A. Use Classification					
B. Product Classification					
C. National Hardwood Lumber Association Rules					
XVII. Air Drying Lumber	S				
A. Objectives					
B. Principles					
C. Site Selection					
D. Yard Layout					

	Level * I/S	Grade 9	10	11	12
E. Pile Foundations					
F. Methods of Piling					
G. Air Drying Defects and Their Control					
XVIII. Kiln Drying Lumber	S				
A. Kiln Types and Construction					
B. Relation of Temperature, Relative Humidity and Equilibrium Moisture Content					
C. Kiln Schedules					
D. Kiln Samples					
E. The Complete Kiln Run					
F. Equalizing and Conditioning Treatments					
XIX. Wood Preservation	S				
A. Introduction					
B. Natural Durability of Wood					
C. Wood Preservatives					
1. Oils and oil-borne preservatives 2. Water-borne preservatives 3. Patented preservatives					
D. Preparing Timber for Treatment					
E. Wood Preservation Processes					
1. Nonpressure methods 2. Pressure methods					
Recreation					
I. Leisure and the Outlook for Rural Recreation	S				
A. Outlook					
B. Occupations					

	Level	Grade			
	* I/S	9	10	11	12
II. Vacation Farms and Ranches	S				
A. Demand					
B. Income Potential					
C. Profitable Additions					
1. Hunting					
2. Fishing					
3. Skiing					
D. Requirements					
E. Management					
III. Campground, Picnic and Sport Areas	S				
A. Demand					
B. Income Potential					
C. Profitable Additions					
D. Requirements					
E. Management					
IV. Fishing Waters	S				
A. Demand					
B. Income Potential					
C. Profitable Additions					
D. Requirements					
E. Management					
V. Hunting Areas	S				
A. Demand					
B. Income Potential					
C. Profitable Additions					
D. Requirements					
E. Management					
VI. Shooting Preserves	S				
A. Demand					
B. Income Potential					
C. Profitable Additions					
D. Requirements					
E. Management					

			Level	Grade			
			* I/S	9	10	11	12
VII.		Scenic, Historic, and Nature Areas	S				
	A.	Demand					
	B.	Income Potential					
	C.	Profitable Additions					
	D.	Requirements					
	E.	Management					
VIII.		Land-Use Right and Cabin Sites	S				
	A.	Demand					
	B.	Income Potential					
	C.	Profitable Additions					
	D.	Requirements					
	E.	Management					
IX.		Selecting the Recreation Enterprise	S				
	A.	The Rural Land Owner and His Family					
	B.	Evaluation of Potential Land Use					
	C.	Location and Population					
	D.	Accessibility					
	E.	Utilities Needed					
	F.	Economic Benefit and Cost Analysis					
	G.	Complementaries and Competition					
	H.	Resource Assistance					
	I.	Planning in the Final Analysis					
X.		Planning and Developing the Enterprise	S				
	A.	Recreation in the Conservation Plan					
	B.	Construction of Facilities					
	C.	Establishing New Vegetation					
	D.	Sewage Disposal and Water Supply					
	E.	Permits and Plans					
	F.	Health and Sanitation Regulations					
	G.	Zoning					
XI.		Technical and Financial Assistance Available	S				
	A.	Bureau of Outdoor Recreation					
	B.	Soil Conservation Service					
	C.	Forest Service					
	D.	Rural Electrification Administration					
	E.	Economic Research Service					
	F.	Farmer's Home Administration					
	G.	Agricultural Stabilization and Conservation Service					
	H.	Rural Community Development Service					
	I.	Federal Extension Service					

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		Level * I/S	Grade 9	10	11	12
XII.	Maintaining and Operating the Enterprise	S				
	A. Quality Control of Service					
	B. Quality of Recreation Facility					
	C. Landscaping Recreation Grounds					
	D. Public Relations					
	E. Customer Relations					
	F. A Brochure: What it should say					
	G. Promotion Techniques					
XIII.	Merchandising Rural Recreation Activities	S				
	A. Publicity					
	B. Promotion					
	C. Advertising					
XIV.	Managing Rural Recreation Enterprises	S				
	A. Business Management Procedures					
	B. Bookkeeping and Accounting					
	C. Federal, State, and Local Taxes					
	D. Liability and Insurance Protection					
	E. Local, State, and Federal Laws					

Special Products

Maple Syrup

I.	Economic Importance in New Hampshire, Northeast and United States	S				
II.	Occupational Opportunities	S				
	A. Maple Syrup Producer					
	B. See Encyclopedia of Careers for Vocational Guidance					
III.	Sugar Maples Varieties	S				
	A. Black Maple					
	B. Red Maple					
	C. Sugar Maple					
	D. Silver Maple					
IV.	Sugar Grove	S				

	Level	Grade			
	* I/S	9	10	11	12
A. Description					
B. Sap Yields and Sugar Content					
C. Management					
1. Spraying					
2. Pruning and thinning					
3. Roadways					
4. Pasturing					
V. Tree Tapping	S				
A. Data of Tapping					
B. Selection of Tree					
C. Boring Tapholes					
D. Life of Taphole					
1. Micro-organisms					
2. Pills					
E. Sap Spouts					
F. Rainguards					
G. Sap Buckets					
1. Metal					
2. Plastic (bucket and bag)					
VI. Gathering Sap	S				
A. Collecting Tank					
B. Pipeline System					
C. Storage Tank					
D. Storing (holding)					
VII. Evaporation	S				
A. House					
1. Location					
2. Function					
3. Requirements					
4. Design					
a. steam ventilation					
b. location of evaporator					

c. air supply
d. syrup processing room
e. wood storage
f. storage tank

B. Evaporation Process

1. Designs
2. Rule of 86
3. Changes in sap during evaporation
4. Evaporation time
5. Liquid level in evaporation
6. Rates of evaporation
7. Operation
    a. starting
    b. drawing off
    c. finishing pan
    d. completion of run of sap
    e. cleaning the evaporator
8. Types of evaporators
    a. open pan
    b. steam
    c. vacuum
    d. high speed tube-type evaporator
9. Fuels used
    a. wood
    b. oil
    c. electric
    d. gas

VIII. Maple Products S

A. Syrup

1. Composition of sap and syrup
2. Color and flavor
3. Factors controlling color and flavor
4. Rules of syrup making
5. Grades of syrup
6. Control of finished syrup
    a. viscosity of maple syrup
    b. old standards of finished syrup
    c. use of precision instruments
    d. elevation of the boiling point
    e. special thermometer
    f. hydrometers

	Level	Grade
	* I/S	9 10 11 12

7. Classification
    a. sugar sand
    b. sedimentation
    c. filtration (flat, hat, machine, etc.)

8. Standards
    a. for retail sale
    b. U. S. standards
    c. producer associations

9. Checking and adjusting density
    a. weight method
    b. refractometry
    c. hydrometry
    d. brix scale
    e. baume scale
    f. making density measurement
    g. correcting for temperature
    h. adjusting the density
    i. alligation (Pearson's Squire)

10. Grading the syrup by color
    a. color standards
    b. U. S. color comparator
    c. use of color comparator

11. Packaging
    a. stack burn
    b. control of micro-organisms
    c. size and type of package

B. Maple Sugar

1. Equipment
2. Chemistry
3. Crystal formation
4. Invert sugar
5. Doctor solutions

C. Maple Cream or Butter

1. Syrup for creaming
2. Invert sugar content
3. Cooking and cooling
4. Creaming
5. Holding and storing cream
6. Packaging

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	Level * I/S	Grade 9 10 11 12

D. Soft-Sugar Candies

1. Cooking, cooling and stirring
2. The bob
3. Crystal coating
4. Packaging

E. Other Products

1. Maple spread
2. High-flavored maple syrup
3. Crystalline honey - maple spread
4. Rock candy
5. Hard sugar
6. Granulated or stirred sugar
7. Maple on snow

F. Testing for Invert Sugar

1. Preparing the syrup and water dilution
2. Testing for color
3. Simplified tests
4. Interpreting color tests

Nuts

Christmas Trees

	Level	Grade
I. Christmas Tree Industry	S	
A. United States Production		
B. Imports		
II. Growing Christmas Trees	S	
A. Varieties		

1. Balsam Fir
2. Red and White Spruce
3. Scotch and Red Pine
4. Eastern Red Cedar

B. Improving Natural Stands

1. Weeding and thinning
    a. chemical (see 01.01-02-07-03)
    b. mechanical (see 01.03-01-03-00)
    c. control cattle grazing

2. Clipping

3. Periodic cutting

4. Spot planting

C. Planning a Plantation

1. Species in demand

2. Suitability of soil and site

3. Time and money available

4. Use of tree
    a. Christmas tree
    b. pulpwood
    c. sawlog
    d. combination of above

5. Source of seedlings
    a. State forest nursery
    b. reputable nurseryman
    c. flower plantations (wildlings)

6. Consultant
    a. county forester
    b. growers
    c. conferences

D. Selection of Site

1. Idle lands
2. Soil drainage
3. Type of soil

E. Site Preparation

1. Removal of wild trees and brush
2. Grass mowing
3. Sod scalping

Level	Grade			
* I/S	9	10	11	12

F. Planting

1. Heeling in
2. Machine planting
3. Hand planting
4. Spacing
5. Access roads
6. Firebreaks

G. Cultivation

1. Grass removal
   a. mowing
   b. chemical

2. Lateral clipping or shearing

3. Basal pruning

4. Bark scarring

5. Tip pruning

H. Growth period

1. Merchantable size
2. Replanting

I. Turn-up (Stump Culture)

1. Advantages
2. Disadvantages
3. Procedure

J. Insects and Diseases

1. Spruce
   a. White pine weevil
   b. Eastern spruce gall aphid
   c. Cooley gall aphid

2. Balsam fir
   a. Balsam twig aphid
   b. Needle gall midge
   c. Balsam wooly aphid

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Level * I/S — Grade 9 10 11 12

3. Gypsy moth
    a. quarantive area
    b. laws governing

K. Environmental Damage

1. Needleburn

L. Chemical Control of Woody Stems

1. 245T (see 01.01-02-07-03)

III. Marketing — S

A. Selling (FOB)

1. Handling cost
2. Contracts
3. Bundling and yarding
4. Pricing
    a. tree height
    b. grades
    c. market demands
    d. stumpage

B. Local Sales

1. Individual selection and cutting

C. Greens and Boughs

1. Market demands
2. Market requirements
3. Pricing
    a. FOB
    b. local

D. Miscellaneous Products

1. Wreaths
2. Swags
3. Center pieces
4. Grave blankets

E. Federal Standards and Regulations

1. Grading
2. Transportation

Other Special Products (Specify)

Other Forestry (Specify)

Other Agriculture (Specify)

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